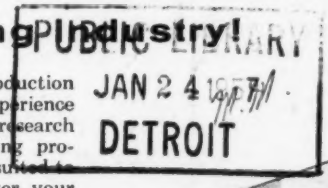
- Pulp washing – valveless washers, screw presses
- Analysis of pulp washing practices
- Organic coatings – acrylic resins, polyethylene, polystyrene, vinylidene copolymers

The Paper Industry

TECHNOLOGY DEPT.

Swenson Puts Ideas to Work

for the Processing Industry!



Ideas for better process methods will start to work for you when you read Swenson's new 12-page brochure, "An Open Door". Just off the press it shows how Swenson Engineering assists in solving many evaporation, crystallization, filtration, pulp washing and spray drying problems.

It introduces the facilities and operations of the Swenson Evaporator Company. Many installations of Swenson equipment are illustrated and described. Truly "An Open Door" to lower production costs, it shows how experience combined with extensive research and modern manufacturing provides the equipment best suited to particular needs. Whatever your position . . . engineer, president, manager, chemist . . . be sure to request this brochure. It is interesting and informative. Send for your copy today!

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Since 1889

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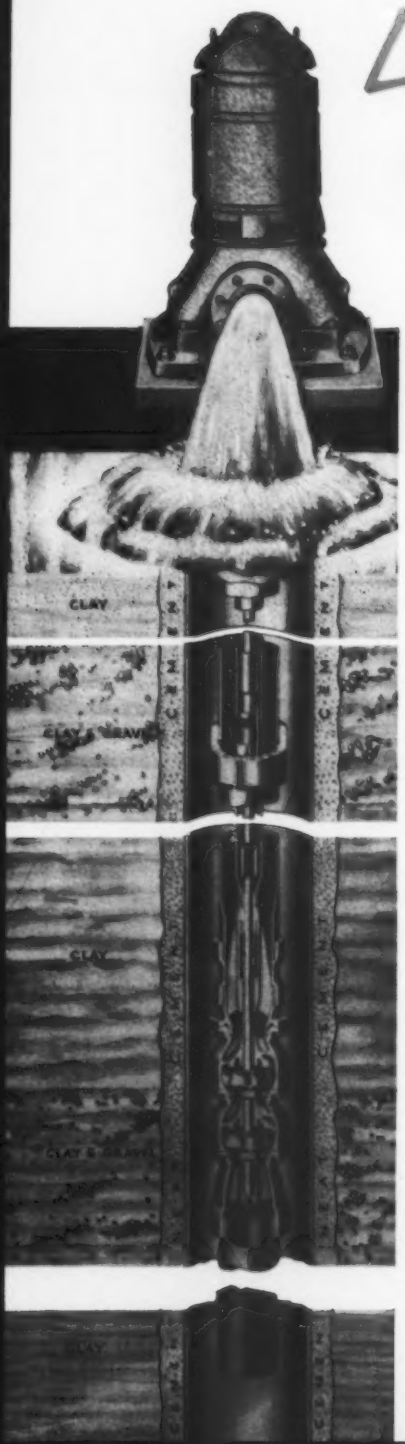

On whose say-so? Not on ours—but on the experience of scores of American and foreign firms and municipalities whose very existence and success depend on an adequate supply of water.

Knowing where the water is — and then tapping the subterranean source is but a part of the vast knowledge the Layne organizations have accumulated in three quarters of a century.

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YOUR NEXT WELL AND PUMP INSTALLATION MAY BE MONTHS OFF. GET TO KNOW THE LAYNE FOLKS IN YOUR AREA. SAVE TIME AND MONEY THROUGH THEIR INTIMATE KNOWLEDGE OF WATER.

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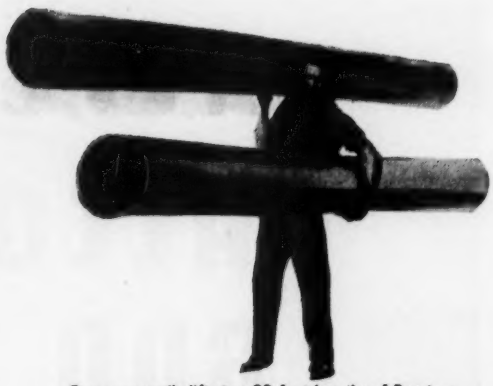
NEW FACTS ON PVC

(POLYVINYL CHLORIDE PLASTIC FOR PAPER MILL APPLICATIONS)

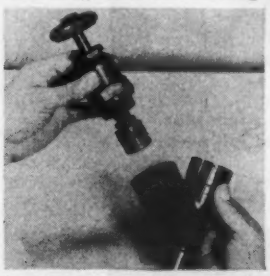


One man easily lifts two 20-foot lengths of Ryertex-Omicron PVC pipe 14" in diameter—proof of the amazing lightness that makes this corrosion resistant plastic easy to handle and install.

New booklet shows how this remarkable plastic solves tough corrosion problems

If your operation involves any corrosive element, it will pay you to get this new booklet on Ryertex-Omicron PVC . . . and investigate the 20-year record of the plastic that won't corrode, rot or "age." Here's what the booklet includes:

Data on properties—More than 280 commonly encountered corrosive solutions and gases to which Ryertex-Omicron PVC is resistant are listed in a table showing concentrations and temperatures. Advantages such as non-support of combustion, non-magnetic and non-sparking properties and low flow resistance are detailed. Maximum operating pressures of all sizes of Ryertex-Omicron PVC pipe are given and their weight per foot listed. (The plastic weighs only 1/6 as much as steel—½ as much as aluminum.) In short, the booklet answers hundreds of questions about how Ryertex-Omicron PVC may solve your toughest corrosion problems.



Injection molded globe valve of Ryertex-Omicron PVC. The same smooth finish on the inside assures maximum flow.

Typical applications—The ability of Ryertex-Omicron PVC to withstand temperatures of 165° F. in continuous service make it suitable for many applications previously barred to plastics. Moreover, it can be formed and welded as readily as metal. In paper mills, Ryertex-Omicron PVC is recommended for: Pulp lines, chlorine lines, chlorine gas distributors, white water tanks, sizing tanks, head boxes, troughs, flow boxes and baffles, blowers, heater linings, fan housings, wet side bars and girths, trays and pulp measuring devices—to name just a few of many applications.

Forms and sizes available—Rigid non-plasticized Ryertex-Omicron PVC.

SHEETS: Fully extruded sheets (not laminated) 1/32" through ⅜" thick, 40" wide x any length. Molded sheets ½" thick and heavier, 48" wide x 96" long.

PIPE: Schedule 40 and schedule 80 pipe extruded in pipe sizes through 10". Larger sizes welded from pre-curved PVC sheets.

VALVES & FITTINGS: Injection molded and fabricated valves; socket type and threaded fittings; socket type, threaded and blind flanges for all pipe sizes. In addition we fabricate any type of special fittings to order.

RODS: Available in sizes up to 4" in standard 10' and 20' lengths.

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INDUSTRIAL PLASTICS AND BEARINGS DIVISION

SEND FOR THIS BOOKLET

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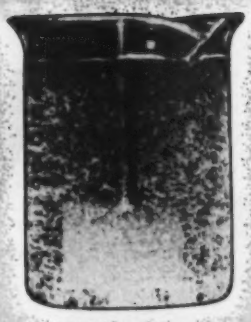
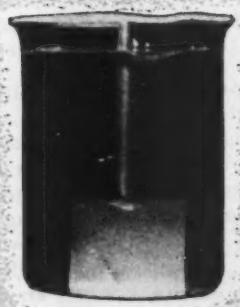
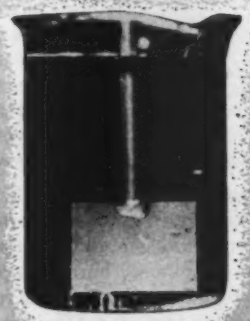


Alum



Alum plus typical polyelectrolyte



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The Paper Industry

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VOLUME 38 • NUMBER 10 • JANUARY 1957

Features . . .

Editorial — The pulp and paper industry in 1957 831

Whither? Southern pine advances to a new potential — Bundling of pulpwood facilitates handling and transportation — Determination of lignin by absorptionetric method — A new package for "heat-and-eat" food products — Latin American imports of paper products 912

Pulp washing 848

Outline of pulp washing practice 848
by Clinton E. Textor

Measuring brown stock washer effectiveness 850
by William G. Dedert and H. K. Waters

Brown stock washing of softwood kraft 853
by Thomas B. Calhoun, Malcomb B. Pineo and David Wetherhorn

Analysis of a pulp washing system 854
by Bruce Armstrong

Progress report on Pressafiners 859
by M. E. Ginaven and A. H. Adams

Organic coatings for paper — Part IX 861

CZ to build $8,000,000 plant at Antioch 872

Newsprint production at new record levels, NAC reports 873

Copper discard vital to Brown Co. mill 875

News . . .

News of the Industry 872

Names in the News 883

Necrology 886

Safety 895

Departments . . .

Current Comments 867

Coming Events 881

Patent Reviews 888

Foreign Abstracts 891

New Products 897

New Literature 905

Current Market Quotations 909

Index to Advertisers 911

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From our point of view . .

The Pulp and Paper Industry — 1957

ALL INDICATIONS point to a new record year of output, even in terms of some of the more conservative estimates, which put the total 1957 production at 32.5-33 million tons, a 3-4 per cent increase over the 1956 figure of 31.5 million tons.

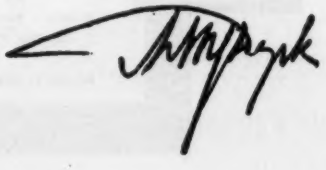
The note of optimism is inevitable in view of the strength of the national economy. Gross national product, now at 410 billion dollars, is expected to rise to 435 billion dollars in 1957. "Chemical Week" predicts a rise of the output index for the paper industry to 170 from the 1956 index of 162. This would entail an output increase of 4.9 per cent over that of 1956.

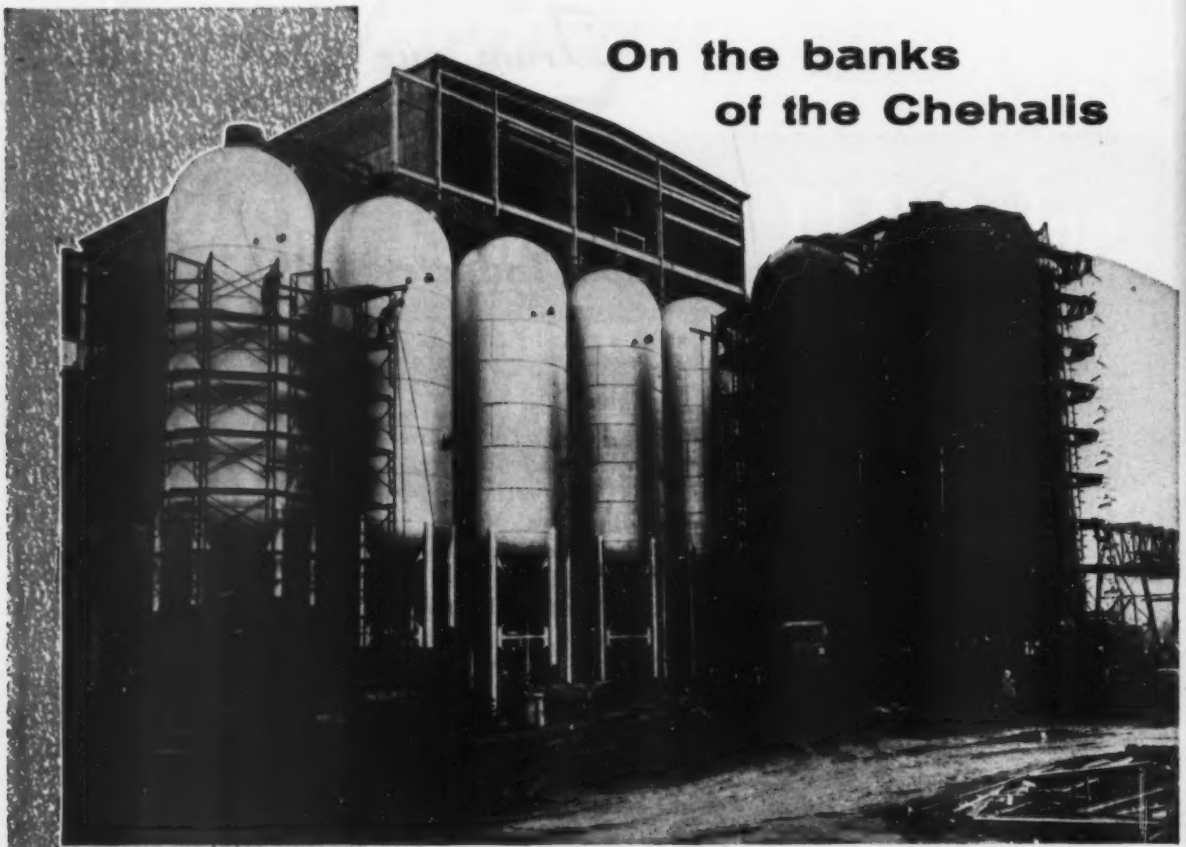
While the industry is riding on a high crest, it would be unwise, however, to ignore the words of caution voiced by some industry leaders who are seeing danger signals — although admittedly of short-range effect — in the recent and continuing high rate of expansion in pulp and paper. This rapid growth, they fear, may result in a temporary imbalance of demand and supply in the next few years.

Furthermore, there are a number of important, adverse economic pressures that will confront the expansion-minded industry in 1957. Costs of labor, shipping and equipment will be higher, while money is likely to remain tight.

On the other hand, no shortages of raw materials are anticipated; and, while chemicals are generally on an upward price trend, an over-abundance of some chemicals and new manufacturing capacity that will come into production in 1957 to create a good supply of other raw materials may lead in some cases to price concessions. New chemicals will also be introduced to the paper industry, e.g. an odor-free rubber latex will make its debut early in 1957.

Again, on the credit side, technological progress is bound to acquire renewed, powerful momentum to counteract the adverse economic pressures and to cope with a keen competition that has come in the wake of rapid industrial expansion. This will put new emphasis and a high premium on high-caliber research, new ideas, new products and a greater operating efficiency.





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CB&I field erects and field stress relieves 7 digesters and 4 accumulators

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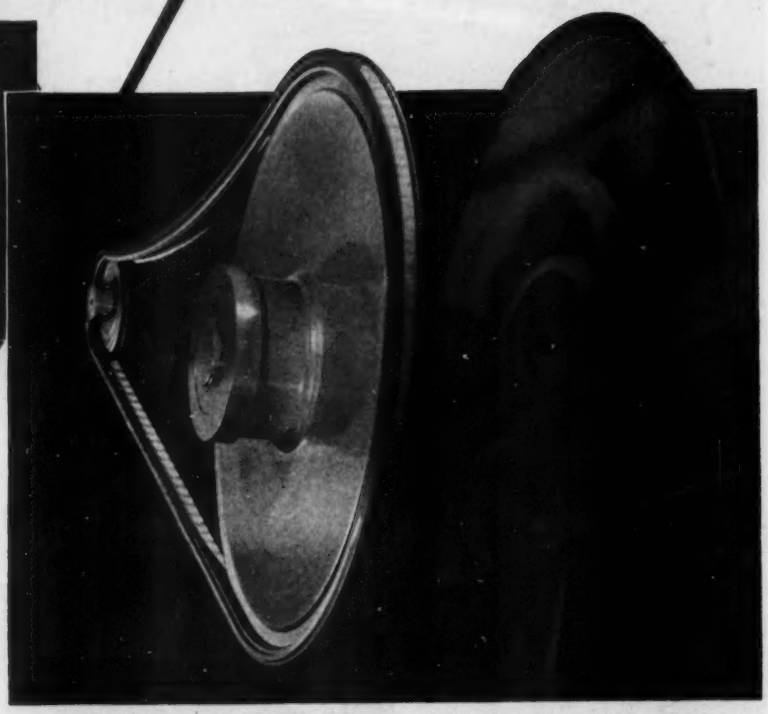

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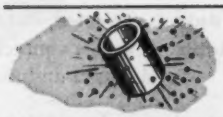

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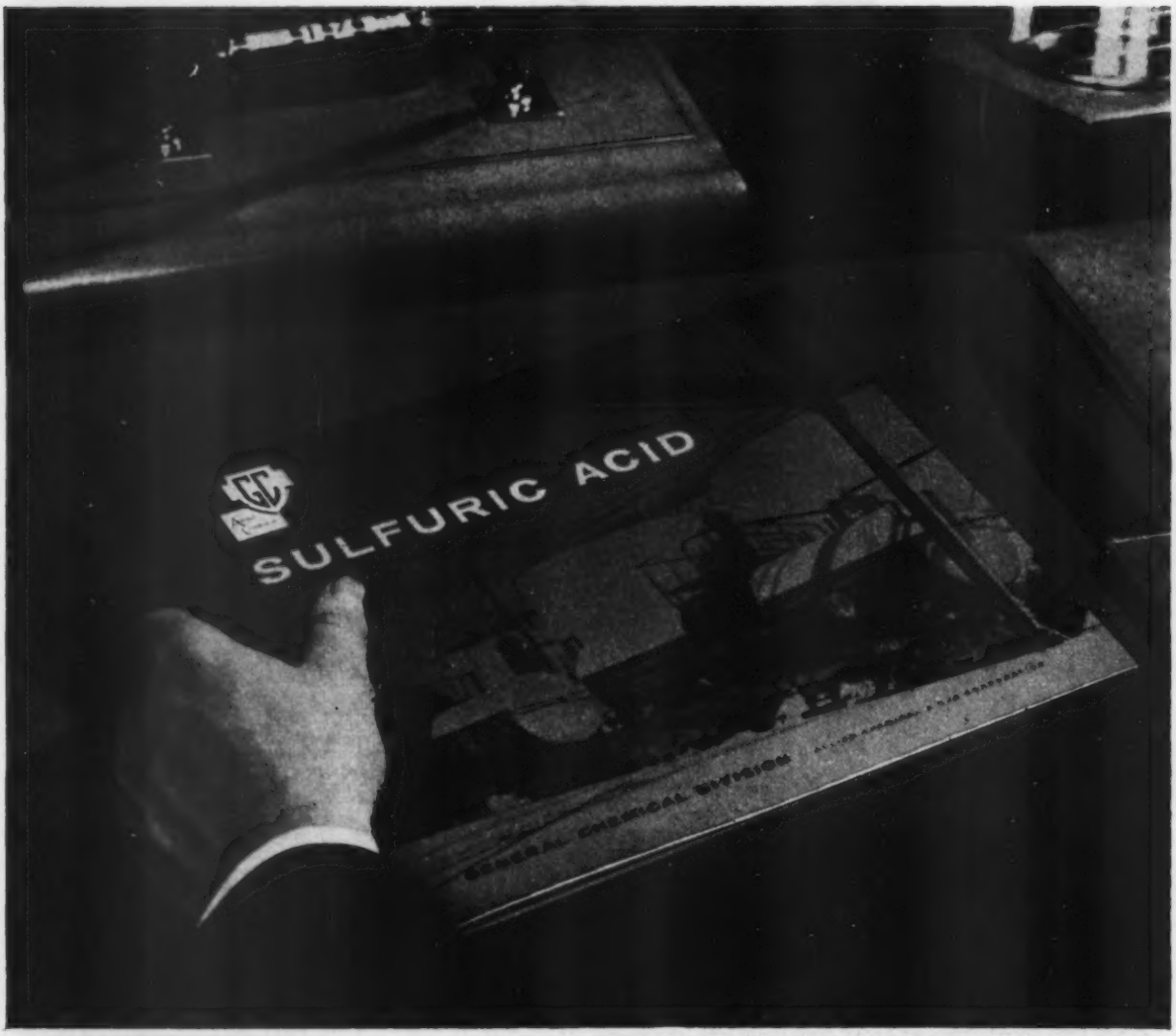

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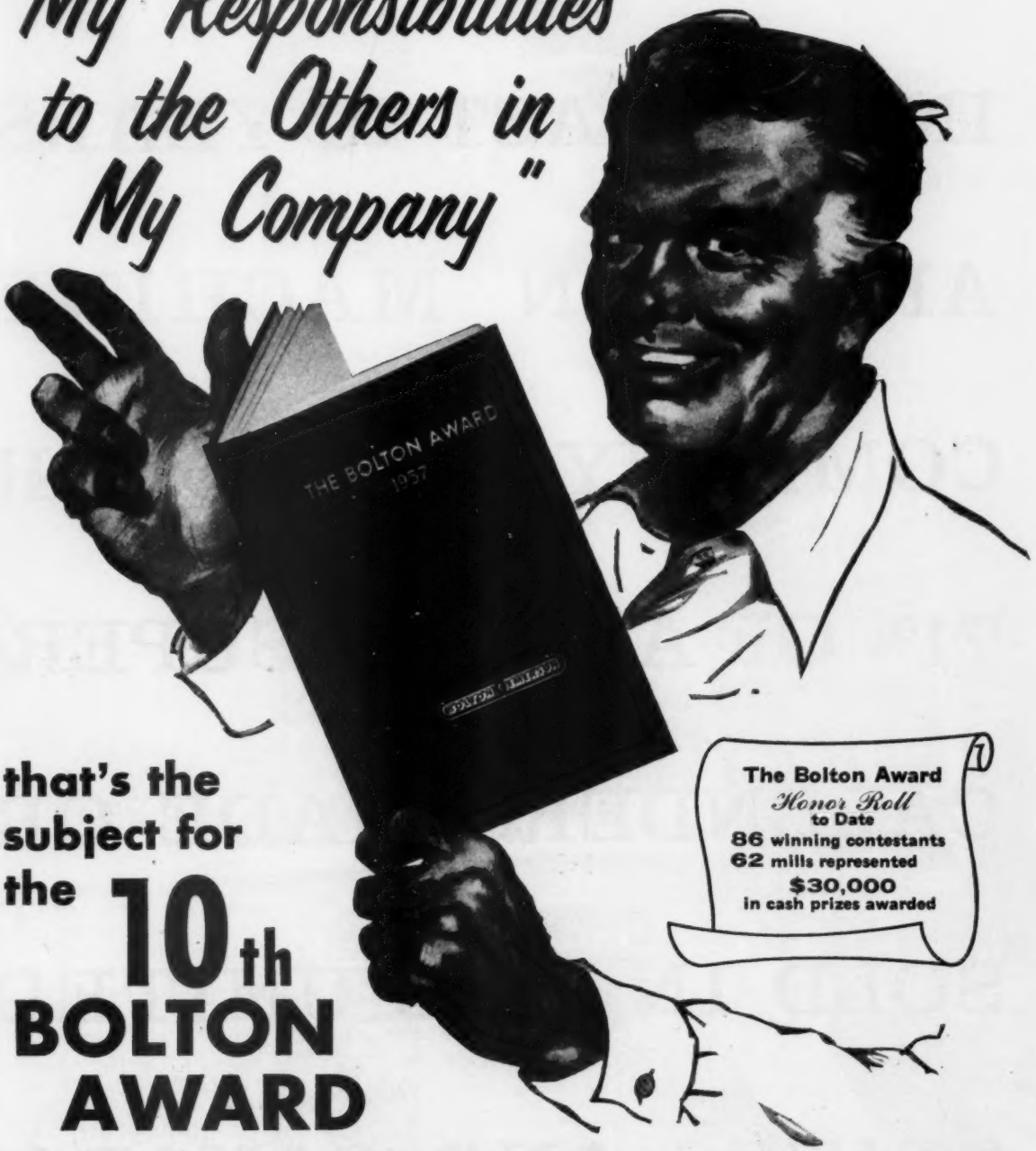

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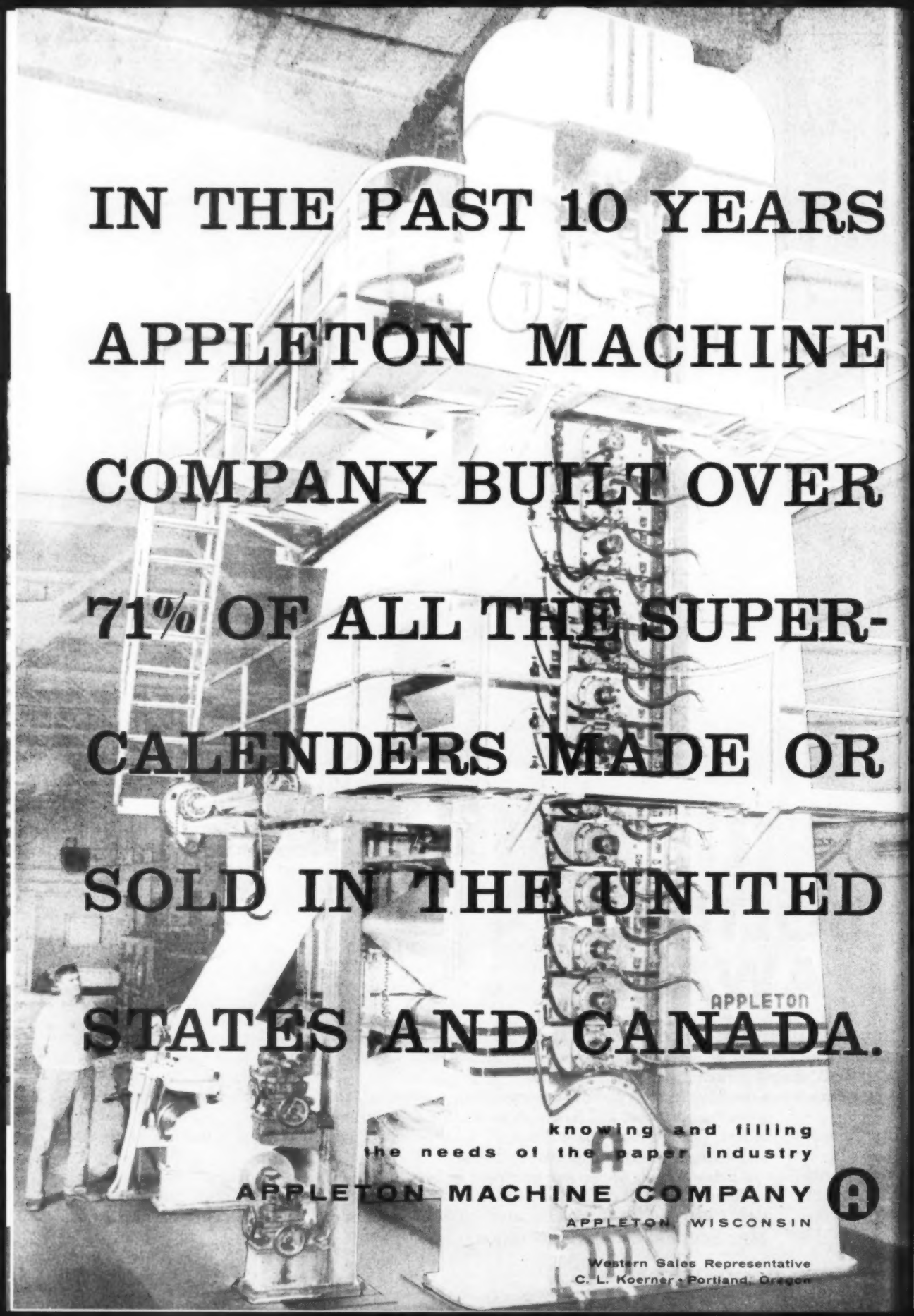
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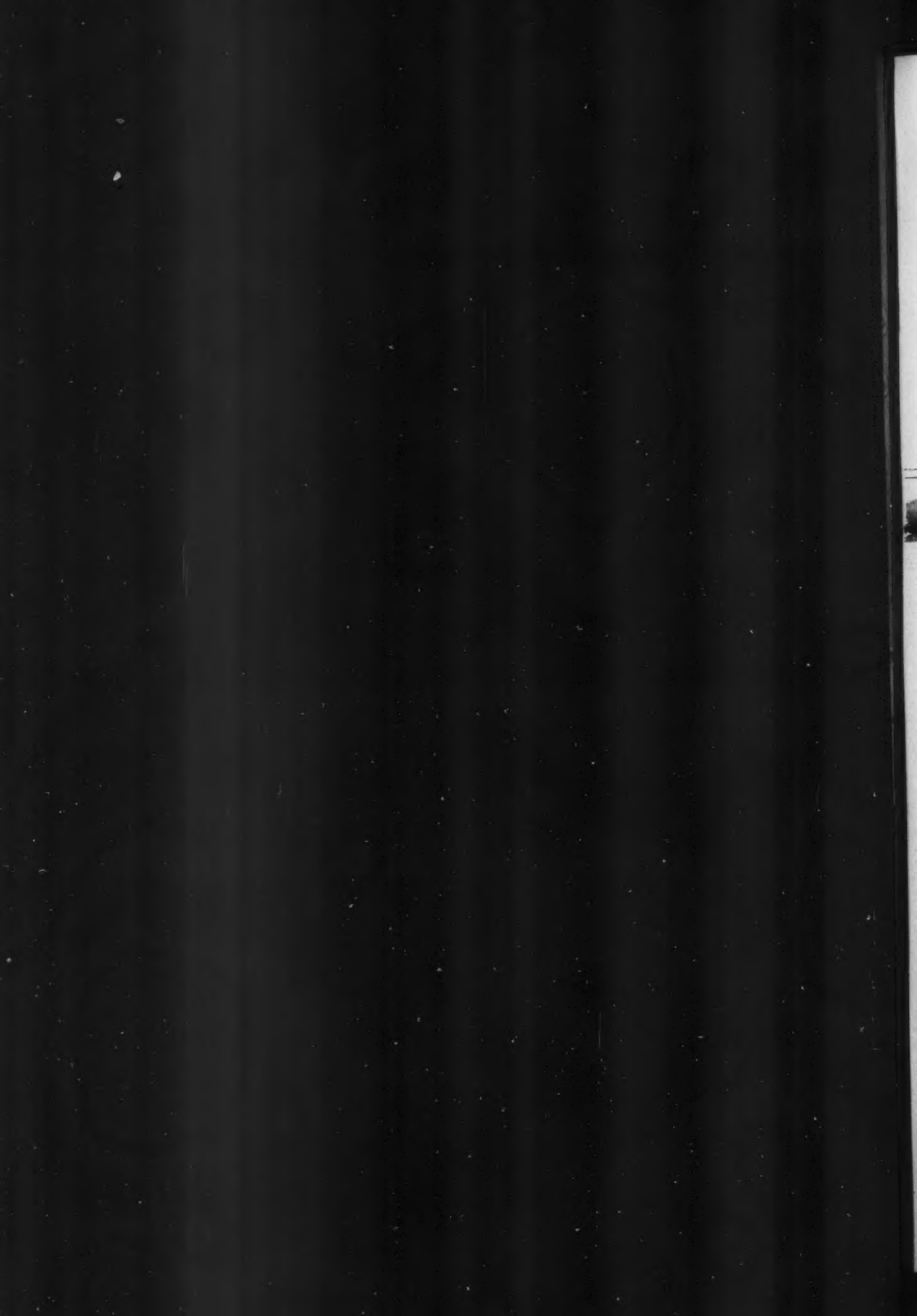

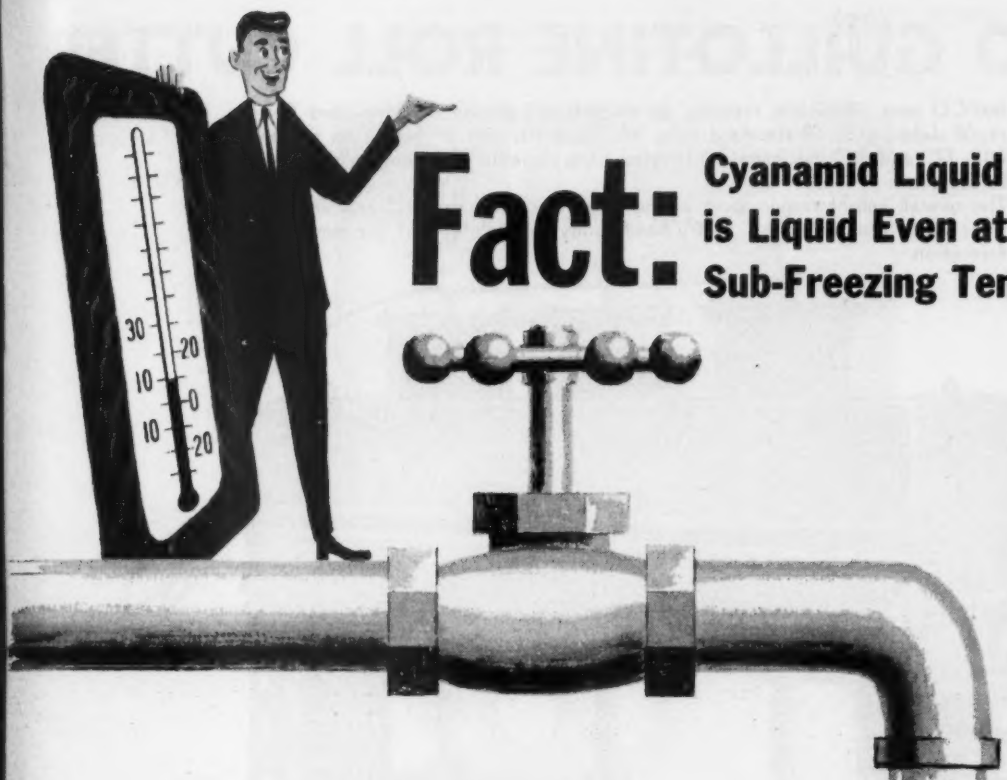

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...that Alum was used by the Romans to fireproof their siege weapons?

...that money from Alum helped save Christendom from the Turks 500 years ago?

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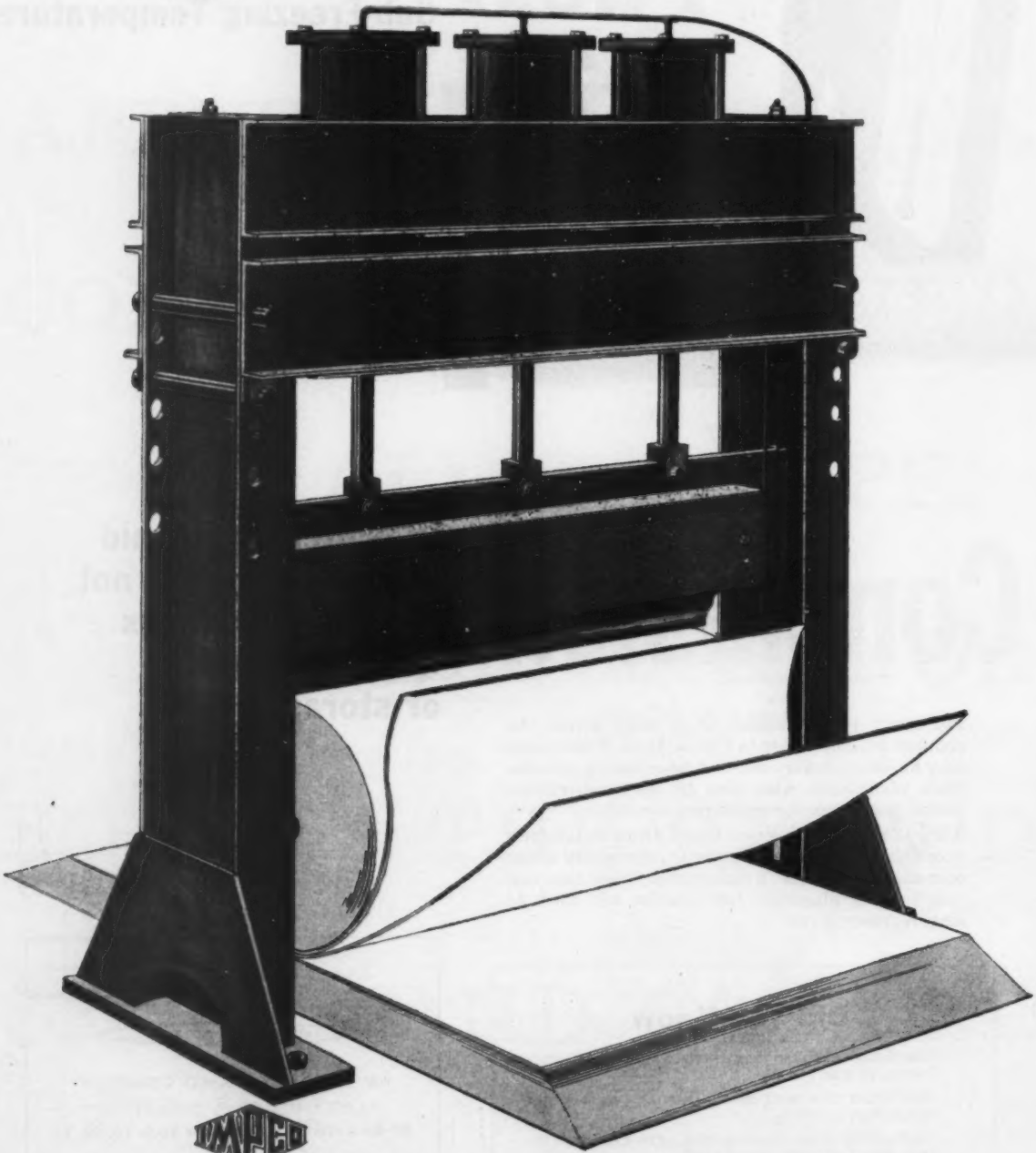

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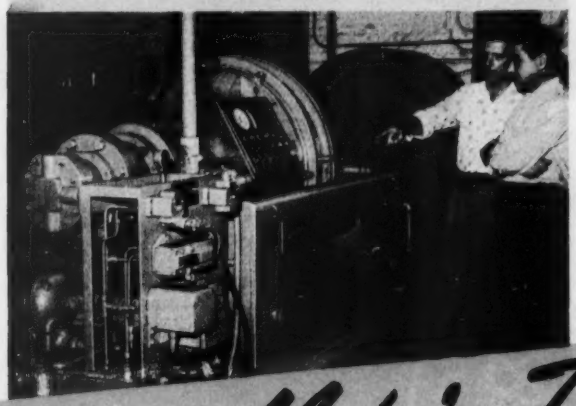
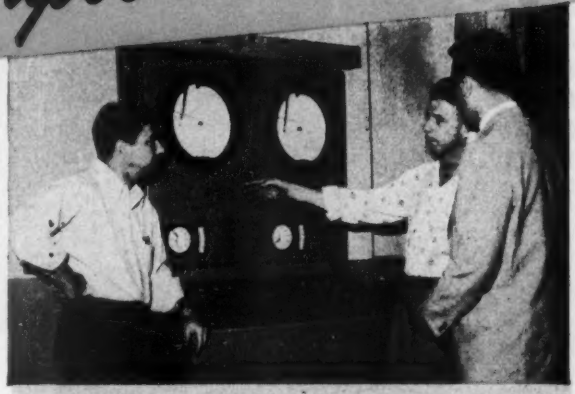
Sherbrooke, Quebec

One of the Bauer No. 442 Pump-Through Refiners at Otsego Falls Paper Mills. Left to right, Cliff Sage, Jr., Paper Mill Superintendent; Joe Cutro, Plant Engineer.



A Paper Maker's Dream



Control Panel of the Bauer Pump-Through Refiners. Left to right, Joe Cutro, Cliff Sage, Jr., and Bauer's Electronic Engineer Don Michel.

At Otsego Falls Paper Mills, Inc., Division of Menasha Wooden Ware Corporation, Otsego, Mich., two Bauer No. 442 Pump-Through Refiners prepare the stock to the desired degree through automatic regulation. This is effected by sensing slight variations in the freeness of stock on the wires.

Cliff Sage, Jr., paper mill superintendent, says the machine is a paper maker's dream, due not only to the automatic regulation, but also to leveling off fluctuations in stock characteristics . . . better hydration . . . better formation . . . higher speed . . . fewer breaks . . . less shrinkage . . . lower horsepower . . . better and more uniform quality of paper.

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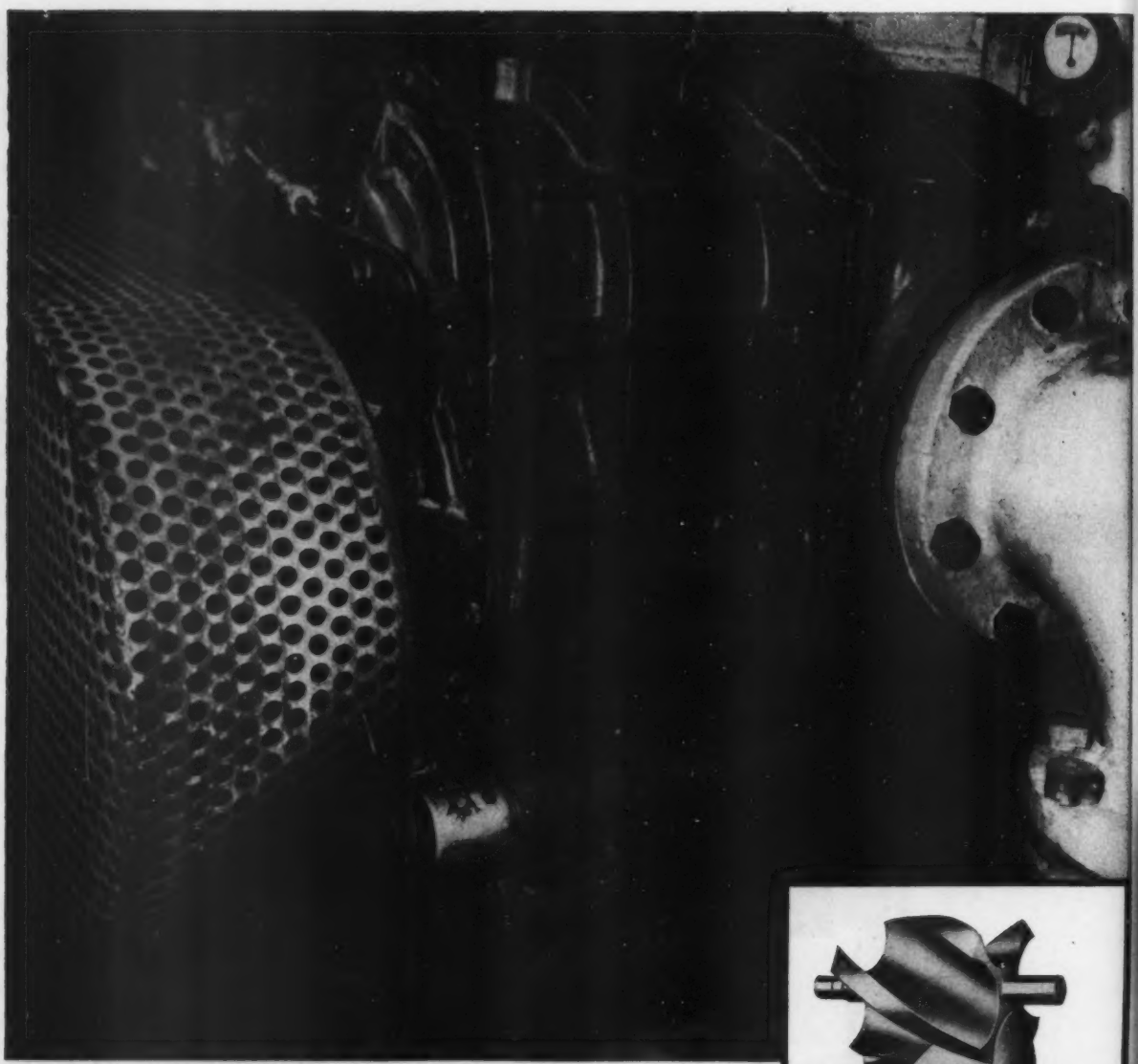

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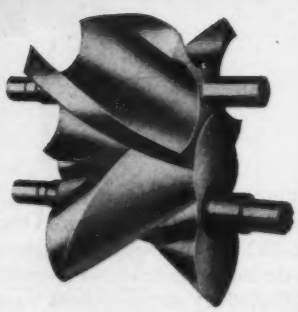

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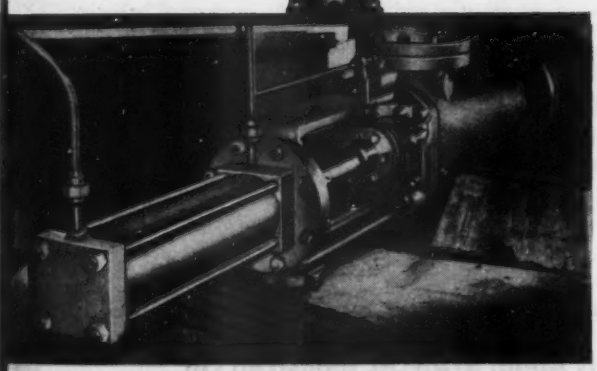
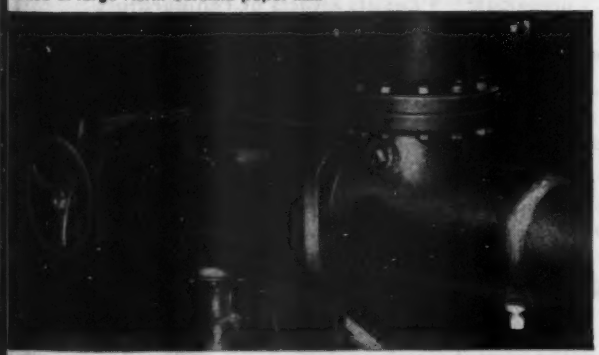


HYDRAULIC-OPERATED Yarway Digester Blow Valve—one of six installed at large North Carolina paper mill.



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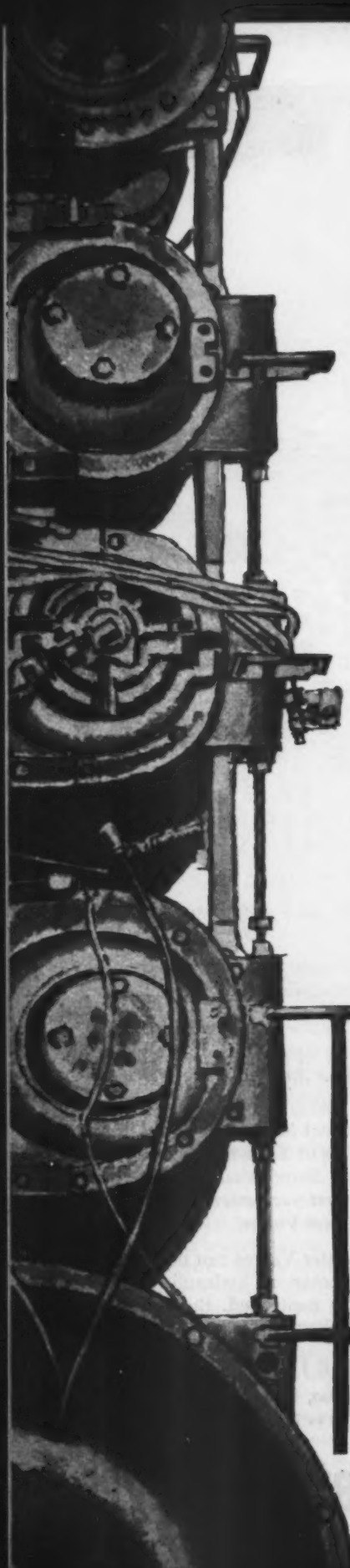

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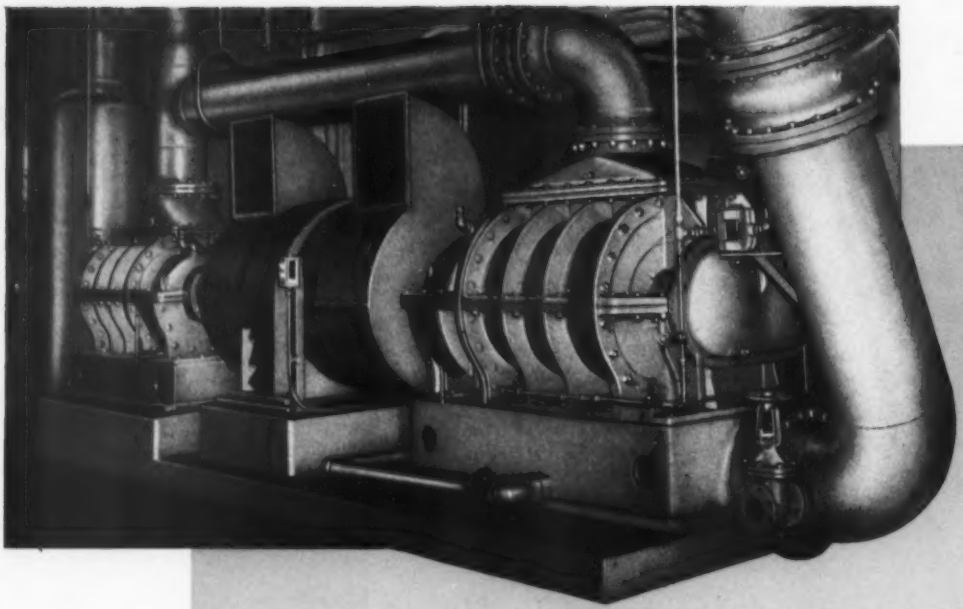

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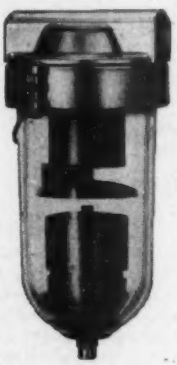

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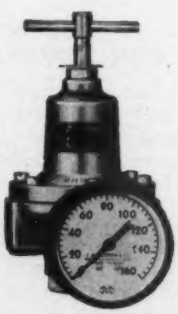

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JACK B. RINCKHOFF (right), Chief Engineer, Sulphuric Acid & Phosphates Dept., Chemical Construction Corp., N. Y. City. Left, Michael De Piano, New York Cooper Alloy Representative.

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Q. Mr. Rinckhoff, in specifying equipment for the H_2SO_4 plants that Chemico constructs around the world, what Cooper Alloy valve models do you buy most of?

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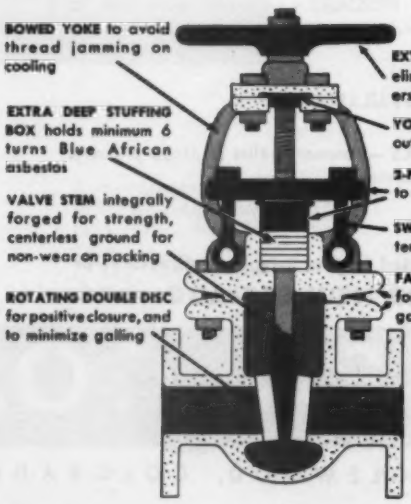
Q. What's your most important reason for buying Cooper Alloy valves?

A. Availability. Your chain of distributors across the country and in remote parts of the world is of great importance to us. In foreign construction we have often specified Cooper Alloy because of this all-important availability.

Q. What about design and quality?

A. Vital. Valve design determines performance, and our specifications are rigid. As a construction company, we can't afford to jeopardize our reputation by installing questionable equipment. Cooper Alloy valves have passed our tough specs, and have my approval for all severe construction applications.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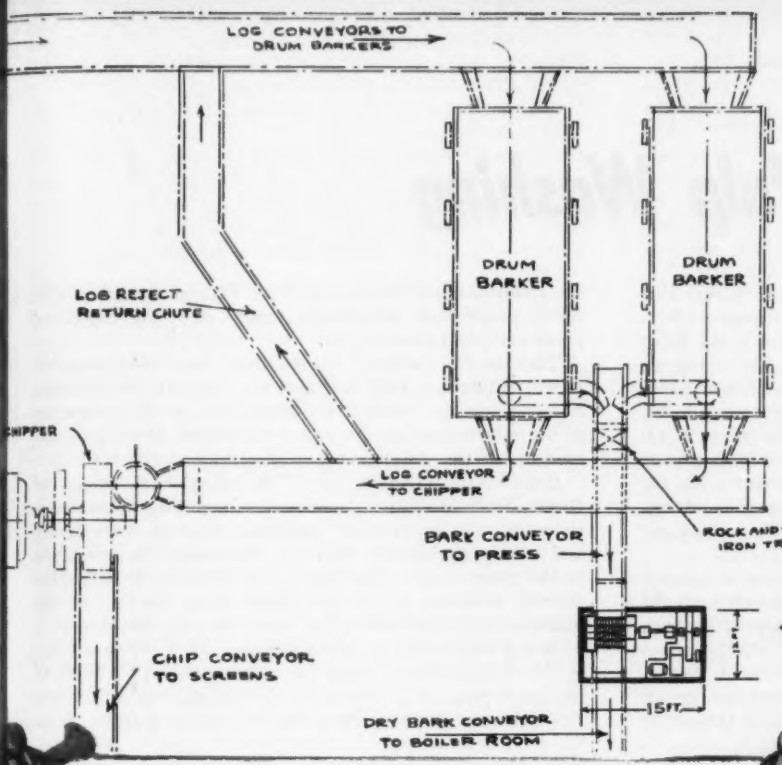

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Pulp Washing

AN UNUSUALLY DISCERNING presentation and discussion of pulp washing data — on both vacuum washers and screw presses — constituted the program of the Fifth Annual Pulp & Paper Conference at the University of Florida December 3-4. With the exception of one paper by C. W. Converse of Sprout-Waldron & Co. and J. W. Dunning of the V. D. Anderson Co., which was not immediately available, all papers are published in this issue of THE PAPER INDUSTRY. This paper, together with the round-table discussion in which a large number of the delegates participated, will be published in a subsequent issue.

Clinton E. Textor, Bauer Bros. Co., presents an outline of pulp-washing practices, discussing requirements of the washing system and washing principles with brief descriptions of the commercially accepted washing equipment.

William G. Dedert and H. K. Waters, Swenson Evaporator Co., review various methods used to measure brown stock washer effectiveness and offer a simplified version of the recommended dilution concept. Factual operating data for a number of installations show how the suggested measures can be employed.

Thomas B. Calhoun, Dorr-Oliver Inc.; Malcomb B. Pineo, Brunswick Pulp & Paper Co., and D. Wetherhorn of Savannah, Ga., show that differences in washing capacity of vacuum brown stock washers have been eliminated, regardless of the different types of pulp washed.

Bruce Armstrong's paper, "An Analytical Study of Brown Stock Washing", is a reminder that mathematics is becoming an increasingly important tool in interpreting and solving operational problems. The numerous references to Mr. Armstrong's paper during the round-table discussion showed evidence of the delegates' keen interest in the mathematical approach to the study on pulp washing.

In a progress report on Pressafiners, M. E. Ginaven and A. H. Adams, Bauer Bros. Co., discuss the application of the screw press in (1) pressing raw and impregnated chips, (2) two-stage press washing and (3) pressing aspen chips.

Outline of pulp washing practices

CLINTON E. TEXTOR*

▶ **The requirements of a washing system and washing principles are discussed; among the washing equipment that has found commercial acceptance are wash pans, diffusers, vacuum washers and screw presses.**

THE DEVELOPMENT of pulp washing practices has been slow and erratic — even in the current industrial age — because it was governed more by economics and by temporary industrial developments than by what was known of the technology of the process. For example, metallurgical advances, such as the manufacture of stainless steel, have had a profound impact on type of equipment that may be practicable for pulp washing. The increasing use of pulp and paper fosters larger pulp and paper mills, which tend to demand washing practices which might be too expensive for small plants.

Pulp washing is not a well defined operation with a common, clear-cut objective. It means many things to many people, depending on their needs. The pulp washing requirements of a deinking plant differ radically from those of a kraft pulp mill. It is not the purpose of this discussion

*In charge, Pulp & Paper Div., The Bauer Bros Co., Springfield, Ohio.

to touch on all operations which might properly be classed as pulp washing, so a somewhat arbitrary definition is offered to limit its scope. It is assumed that the word "pulp" requires no definition, but the scope of the word "washing" may justify some attention. The derivation of the word "wash" implies the use of water in cleansing. But, in this current consideration of pulp washing, we believe it will be legitimate to include all practicable procedures for removing dissolved substance from the pulp.

The only procedures for washing without water which currently seem practicable are those including some method of pressing or squeezing the dissolved compounds out of the pulp. Actually, no process which does not include the use of water has ever been seriously suggested for the complete removal of soluble solids. But, sometimes a partial removal of the chemicals is satisfactory, and that opens up the possibility of washing without water.

Requirements of a washing system

There are a great many factors to be considered in choosing or evaluating a pulp-washing procedure. Most of these can be grouped in three main categories: (1) economics, (2) completeness of removal of solubles and (3) water economy. The first two call for careful consideration in practically all installations; the third becomes of prime importance when chemical recovery is practiced and is of increasing significance generally due to such factors as stream pollution and a dwindling supply of good water.

The considerations of the "economics group" include such items as: (a) space requirements, (b) operating and maintenance costs and (c) steam and power requirements. These are the dominant considerations in an evaluation. They overlap the other two groups, but these economic considerations have to be evaluated for each particular mill, as their effects vary with the types of products involved, and with the local situation.

The factor of completeness of removal of solids, or — more simply — completeness of washing, is generally estimated by determining the proportion of dissolved substance remaining in the pulp after washing. In fact, this is usually more important than the amount actually removed. It is generally quite easy to determine. In the kraft-pulping industry, a figure representing the salt cake equivalent of the chemicals left in the washed pulp is widely used and may serve as a prototype for other expressions to indicate degree of completeness of washing. This factor is important in practically all pulp washing operations. There are quite a few washing operations in which the third consideration, water economy, is of minor consequence, though such instances are decreasing because of increasing necessity for recovery of chemicals and elimination of excessive pollution of rivers and streams. For an expression of water economy, we again turn to kraft pulp technology to borrow the term "dilution factor". It is a simple way of reporting the amount of wash water which finds its way into the black liquor and which must subsequently be evaporated. When all of the fresh water employed in a washing system is discharged either in the black liquor or with the pulp, this dilution factor will serve as complete indication of wash-water economy.

Washing principles

All of the commercially acceptable pulp-washing procedures employ one or more of three recognized principles for removal of soluble material from the insoluble; (1) displacement with water, (2) dilution followed by removal of the solution by decantation or otherwise and (3) the pressing out or squeezing out of the solute.

The principle of displacement of the dissolved solids, or black liquor, is the ideal for pulp washing. In theory, the pulp to be washed is deposited in a uniform layer or bed in a tank with a false bottom. The wash water is applied to the top of this layer and travels downward, like a piston, pushing the black liquor ahead of it through an outlet in the bottom of the tank. When the water reaches the false bottom, the pulp has been washed, the black liquor has been separated from it without any dilution whatever.

In actual practice this ideal is never even approximated. There are a great many obstacles. The layer of pulp is not uniform with respect to liquid flow, and channeling results. At best, the rate of downward flow is very slow, and this gives the dissolved chemicals time to diffuse upward into the wash water. Finally, the black liquor has an affinity for the fiber; particularly, the soluble matter absorbed in the cell walls requires time to diffuse outward into the wash water.

The second of three methods of washing, that of dilution followed by removal of the excess liquid, is notoriously wasteful of water. It is the commercial equivalent of washing precipitates in the laboratory. There the precipitate is diluted with water and stirred and allowed to settle; then the supernatant liquor is poured off. In such an operation the percentage of soluble material removed is equal to the volume decanted divided by the total volume of the diluted material. For example, if it is possible to decant 90 per cent of the liquids, then 90 per cent of the soluble matter will have been removed. Obviously, this percentage will be high when the volume left with the precipitate is low. While the potential of this method is low, the percentage realization of the potential is very high, so this method of washing continues in commercial competition with systems which are theoretically much better.

The third method, that of squeezing the liquor out of the pulp, theoretically could have the same ideal results as that of water displacement; that is, complete liquor removal without dilution. But long before the condition could be reached, the pressures would have mounted so high that the fiber would be ruined.

The fibers of the several pulps differ radically in their resistance to pressure, but some can be subjected to enough pressure to reduce the moisture content to 30 per cent without seriously damaging the fiber. To illustrate roughly just how far pressure washing can be expected to apply to pulp washing, we take the example of neutral sulfite semichemical pulp which has been shown to resist pressures which will result in a dryness of 60 per cent. Assuming that this pulp had been cooked in the liquor phase and blown from the digester with a fiber content of 20 per cent, a pressing operation to turn out a cake that is 60 per cent dry will effect the removal of approximately 83 per cent of the soluble matter going to the press.

Commercially accepted washing equipment

Up to about 100 years ago, water economy in washing was not an item. There was no recovery of chemicals, almost no stream pollution problem, and generally an adequate supply of water was available. In consequence, pulp washing equipment received scant attention. A tank with a false bottom to avoid fiber loss was all that was provided. This situation obtains today in most sulfite mills. The blow tank is merely provided with a false bottom. The stock is flooded and allowed to drain. This washing operation receives very little attention. The only objective is to get the liquor out of the pulp. With the advent of the soda process, the situation began to change. Cooking chemicals were used in higher proportion and, in the interests of cost, these chemicals had to be regenerated for further use.

(Continued on page 858)

Measuring brown stock washer effectiveness

WILLIAM G. DEDERT* and H. K. WATERS**

A review of methods used to measure brown stock washer effectiveness and a simplified version of the recommended dilution concept are presented; factual operating data for a number of installations illustrate how the suggested measures can be employed.

THE EFFECTIVENESS of brown stock washers must be measured against two main requirements. The first is the removal and recovery of black liquor solids accompanying the pulp. The degree of cleaning required will vary, depending on the end use of the pulp. The second is the accomplishment of this cleaning job with a minimum of water dilution of the recovered black liquor solids.

These two requirements must necessarily be considered together. Through the range of normal operation a change in one will change the other. In general, as dilution increases, black liquor solids loss decreases. Conversely, as dilution decreases, black-liquor solids loss rises. When judging the effectiveness of a given pulp-washing system or comparing similar systems, it is imperative that both the salt cake loss and dilution be considered. To judge solely on either the salt cake loss or the dilution neglects the interrelation of these two main system requirements.

Through the years a number of methods have been used to determine the chemical loss and dilution. Many of these procedures did not properly represent the system's performance. The examples used in the following discussion will refer to washing systems employing rotary vacuum filters. The conclusions reached apply equally to screw press washers or any combination of screw presses and rotary vacuum filters.

Chemical loss

There have been two approaches to the determination and reporting of chemical loss. Both have reported the chemical loss as Na_2SO_4 per air-dry ton of pulp washed. The difference arises from a general acceptance of the theory that a portion of the Na_2SO_4 is so tightly bound or adhering to the washed pulp that no reasonable amount of washing can remove it. This commonly called bound Na_2SO_4 varies depending on the wood species, hardness of cook, and other variables. One approach concludes that the washing system should not be held liable for this bound Na_2SO_4. The determination of chemical loss thus would involve a laboratory washing or squeezing of the pulp sample to reduce this Na_2SO_4 content to the assumed bound Na_2SO_4 level. The resulting filtrate is then titrated or tested by conductivity for Na_2SO_4 content.

The alternate approach is to report the total Na_2SO_4 accompanying the washed pulp. The total Na_2SO_4 is determined by the zinc uranyl acetate method set forth in Tappi Standard T623 m-44. This procedure involves ashing of the pulp sample, and the Na_2SO_4 reported includes all that existing in the liquor, adhering to the pulp or in any manner bound to the pulp.

It is generally believed that the so-called bound Na_2SO_4 will vary from 5 to 20 lbs. per air-dry ton of pulp. This varying base point limits the value of comparisons or predictions of washing results between systems in widely scattered parts of the country. The reporting of total Na_2SO_4 by the Tappi Standard method provides a fixed base point of zero pounds of Na_2SO_4 per air-dry ton of pulp. This base remains constant regardless of the many variables introduced.

Whenever discussing or comparing chemical losses in brown stock washing, it is imperative to know whether values reported are total Na_2SO_4 or unbound Na_2SO_4. Consider the case when both methods report a loss of 30 lbs. Na_2SO_4 at a given dilution factor. The 30 lbs. reported by the total Na_2SO_4 system actually represents the entire Na_2SO_4 loss from the washing system. However, the 30 lbs. reported by the variable base system is equivalent to 35 to 50 lbs. of necessary Na_2SO_4 replacement. The 5 to 20 lbs. Na_2SO_4 difference represents salt-cake removal at the most difficult level. This point is frequently overlooked when comparing brownstock washers or predicting washer performance.

It is the intent of the above discussion to emphasize the importance of knowing the basis upon which Na_2SO_4 loss figures are reported.

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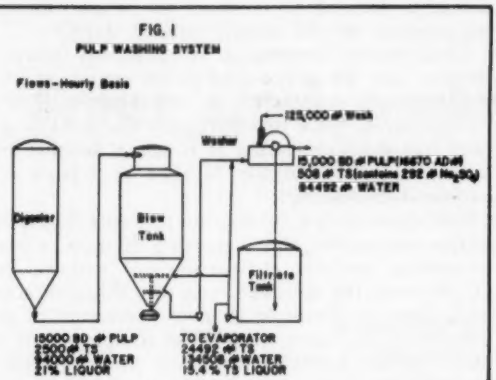
FIG. 1
PULP WASHING SYSTEM



Dilution factor

The second requirement of a brown stock washing system is the recovery of chemicals with a minimum of water dilution of the black liquor solids. To measure the dilution we must determine the amount of water used by the brown stock washing system which joins the recovered black liquor solids. This dilution water must eventually be evaporated before burning the solids in the recovery furnace. Therefore, every effort must be made to reduce this dilution to the lowest possible level consistent with our primary aim of obtaining clean pulp.

Almost all of the dilution water enters as wash water on the last stage of a multi-drum or multi-stage washing system. Other sources of dilution accountable to the brown stock washers are water showers on pre-knotters to suppress foam and clean the knots, water hoses in drum vats to control uneven consistency, and water leakage through packing glands of the various filtrate and stock pumps. None of these represents good practice and cannot be neglected in any concerted effort to reduce dilution, but the discussion at this time will be confined to the dilution entering as wash water on the final stage.

To assist in this discussion we will set up an example pulp washer system with flowsheet simplified by assuming a single-drum instead of a multi-drum installation. Example I and Fig. 1 illustrate the system and pertinent flows are shown.

Example I — Pulp Washer System
- 200 AD tons per day Kraft pulp.
- 250 gpm wash water to showers last stage.
- 15 per cent BD consistency sheet off last stage.
- 35 total lbs. Na_2SO_4 per AD ton pulp off last stage.
- 21 per cent Total solids liquor blown from digester and no recirculation of black liquor to digester charge.
- 3000 lbs. total solids blown from digester per AD ton pulp.
- 11.2 per cent BD pulp consistency as blown from digester.
- Each pound black liquor solids contains 0.575 lbs. Na_2SO_4.

In the system shown, the dilution water joining the wash water minus the 84,492 lbs. of water leaving the recovered black-liquor solids is equal to 125,000 lbs of last stage with the clean pulp or 40,508 lbs. dilution. This dilution must be related to the quantity of pulp being cleaned. The 40,508 lbs. dilution has been used to clean 16,670 AD lbs. of pulp, so the dilution is established as 40,508/16,670 or 2.43 lbs. of dilution water per AD pound of pulp.

This dilution factor can be calculated from the given example data by the formula described by West, Collins and Bergstrom shown in Example II.

Example II — Calculation of Dilution Factor

$$\text{Dilution Factor} = \frac{12000\ A/B - \{1800\ (1/C - 1) - (1.74\ D)\}}{2000}$$

A = wash water, gpm.
B = pulp, air-dry tons/day.
C = per cent moisture-free consistency of pulp off final washer.
D = pounds total Na_2SO_4/air-dry ton pulp remaining in pulp.
1.74 = ratio of black liquor solids in pounds per pound Na_2SO_4.
Dilution = pounds water per pound air-dry pulp added as dilution to the blow liquor.

Applying the above to the pulp washer system of Example I:

$$\text{Dilution Factor} = \frac{12000\ (250/200) - \{1800\ (1/.15 - 1) - (1.74 \times 35)\}}{200}$$

$$= \frac{15000 - 10200 + 61}{2000} = 2.43$$

Substituting the values of the washing system for Example I in this formula results in a calculated dilution factor of 2.43. As can be seen by the flow diagram, the resulting value represents the actual pounds of water entering the recovery liquor cycle per air-dry pound of pulp washed. In our opinion this is the correct method of reporting dilution when measuring the effectiveness of a brown stock washing system.

Other methods of expressing dilution are frequently used. The following reasoning and calculations will illustrate why these alternate methods do not provide a dilution value permitting comparison between different operating conditions or mills.

One of these considers only the gpm. of wash water being put on the water showers of the last drum. This is usually expressed as gpm. wash water used per ADT ton of pulp. A frequently cited criterion of good washing is 1.5 gpm. wash water per daily ADT ton of pulp. In a particular mill this 1.5 gpm. may actually represent good washing results, but the method totally disregards the amount of this wash water leaving the system with the clean pulp and thus not entering the black liquor recovery cycle. Since discharge pulp consistency varies widely from washing system to washing system, the amount of water accompanying the clean pulp will vary accordingly.

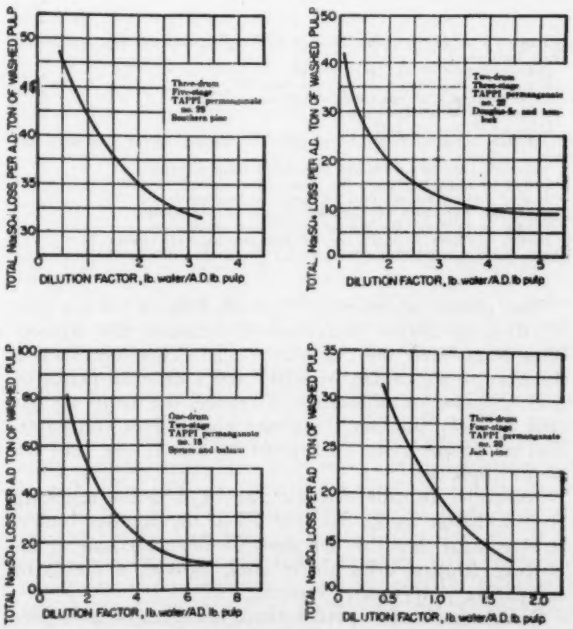

TOTAL Na2SO4 LOSS PER A.D. TON OF WASHED PULP
DILUTION FACTOR, lb. water/A.D. lb. pulp
Three-drum Five-stage TAPPI permanganate no. 29 Beaulieu pine
Two-drum Three-stage TAPPI permanganate no. 29 Douglas-fir and hemlock
One-drum Two-stage TAPPI permanganate no. 18 Spruce and balsam
Three-drum Four-stage TAPPI permanganate no. 20 Jack pine

Fig. 2—Dilution curves of Swenson washing systems.

To check the effect of a changing discharge pulp consistency let us again refer to our example pulp washer system and recalculate the dilution and dilution factor with an 18 per cent BD pulp discharge consistency instead of the original 15 per cent BD. Refer to Example III.

Example III — Calculation of Dilution Factor
All conditions same as Example I except discharge consistency now 18 per cent BD.
15000/.18 = 83300 lbs. pulp and liquor off last stage.
83300 − 15000 = 68300 lbs. liquor off last stage with pulp.
68300 − 508 = 67792 lbs. water off last stage with pulp.
Wash water on last stage — 125000 lbs.
Wash water off with pulp — 67792 lbs.
Dilution into recovery system — 57208 lbs.
Dilution Factor = 57208/16670 = 3.43

A change in discharge pulp consistency from 15 to 18 per cent BD, with all other conditions remaining the same, has resulted in an increase in the dilution factor from 2.43 to 3.43 lbs. of water per AD pound of pulp. Obviously, discharge consistency plays a major part in establishing the system dilution and must be considered in a proper dilution calculation. Since gpm. of wash water per AD ton of pulp disregards pulp consistency, it is not an acceptable measure of dilution and should not be used for comparison purposes.

Dilution has also been expressed as the difference between the concentration of black liquor solids produced in the digester and the concentration of black liquor solids sent to the evaporator. Admittedly, this difference is the result of dilution at the washing system and the method would be useful for comparing systems if all mills produced cooks having the same quantity and per cent black liquor in the digester blow liquor. However, not only do the mills vary considerably in this respect, but within a given mill the digester blow-liquor per cent solids may vary for different grades of pulp produced.

Two mills reporting an equal per cent TS drop between digester blow liquor and evaporator feed liquor may not necessarily have the same dilution at the washing system. To demonstrate the effect of digester per cent solids on dilution and the magnitude of error introduced, we will set up two systems representing this condition. Refer to Example IV.

Example IV — Effect Upon Dilution By Varying Digester Per Cent Solids From Example I
Digester liquor — 21.0 per cent TS.
Evaporator feed liquor — 15.4 per cent TS.
Drop in liquor concentration — 5.6 per cent TS.
Dilution — 40508 lbs.
Dilution Factor — 2.43
Recalculate dilution with 24 per cent TS digester liquor and same per cent TS drop
25000 lbs. TS/.24 = 104,000 lbs. liquor from digester.
104000 − 25000 = 79,000 lbs. water from digester.
24.0 − 5.6 = 18.4 per cent TS liquor to evaporator
24492 lbs. TS/.184 = 133,000 lbs. liquor to evaporator.
133000 − 24492 = 108,508 lbs. water to evaporator.
108508 − 79000 = 29,508 lbs. dilution into recovery system.
Dilution factor = 29508/16670 = 1.77 lbs. water/AD lbs. pulp

The system described in Example I has a 5.6 per cent TS drop in liquor concentration between the digester blow liquor and the evaporator feed. This represents a dilution of 40,508 lbs. of water and a dilution factor of 2.43. Assume an adjacent mill reports the same 5.6 per cent TS drop but has a digester blow-liquor concentration of 24 per cent TS instead of the 21 per cent TS of Example I.

Note the considerable change in dilution resulting from a change in the per cent TS of the digester liquor. It is evident that the per cent TS drop method of reporting dilution does not in itself provide a means of comparing pulp-washer systems.

Sometimes washer performance is expressed as degree *Be* drop. Since this is just another way of reporting a change in per cent TS it should not be used for comparison purposes for the reasons outlined above.

Considerable importance is frequently placed upon the per cent TS in the feed to the evaporator without any reference whatsoever to the digester blow-liquor concentration. Since this disregards the level of digester blow-liquor concentration it is not a measure of dilution and cannot possibly be used as a basis of comparison between mills.

The above review of dilution concepts clearly demonstrates the necessity for measuring dilution in a manner permitting realistic comparison of washing systems. Of the concepts reviewed, only the dilution-factor formula given in Example II gives a measure of dilution permitting this comparison. The complexity of the dilution factor formula may have prevented its wider usage by the paper industry. Much of this complication is due to consideration of the pounds of black liquor solids accompanying the pulp and water off the last stage. Neglecting this, simplifies the formula and the variation in calculated dilution factor is normally only 1 to 2 per cent. In simple terms we want to know how much wash water is put on the water showers and how much of this shower water accompanies the clean pulp off the last drum. The difference is the quantity of water passing through the pulp sheet, down into the filtrate tank and thus joining the recovery liquor cycle. A simplified formula can then be derived as shown in Example V.

Example V — Dilution Factor Formula

$$\text{Dilution Factor} = \frac{\text{gpm. wash water (6)}}{\text{AD tons pulp per day}} - \frac{.9}{\text{percent BD cons.}} - .9$$

Apply this to the system of Example I

$$\text{Dilution Factor} = \frac{250(6)}{200} - \frac{.9}{.15} - .9$$

$$= 7.5 - 5.1 = 2.4 \text{ lbs. water/AD lbs. pulp}$$

Note the slight difference in the dilution factor as calculated by both the rigorous and the simplified equations. The .03 lbs. water difference represents only a 1 25 per cent variation. It is hoped the presentation of this simplified equation will result in the increased application of the dilution-factor concept.

The importance of properly measuring the chemical loss and dilution has now been established. Since these are the two main system requirements, we are now in a position to relate one to the other in an evaluation of a pulp-washing system.

As previously noted, a change in dilution factor results in a change in chemical loss. For any given system a dilution curve can be prepared which graphically illustrates this change. Whenever possible the dilution curve should be based upon uniform production and type of pulp. Fig. 2 illustrates dilution curves for various Swenson pulp-washer installations. These curves were selected to present actual operating effectiveness under a variety of conditions.

Most mills can profit from close supervision of their pulp-washing facilities. This supervision will entail review of the results from day to day and comparison of the system with other systems having similar equipment and operating conditions. Attention must also be given to the economic balance between chemical loss at the washers and evaporator steam costs. This subject has been discussed in a paper entitled, "The Dilution Curve—Its Use in the Correlation of Pulp Washing and Evaporation" by H. K. Waters and R. E. Bergstrom. The fundamental tool required for any of these comparisons is a dilution curve prepared with a consistent basis of measurement for chemical loss and dilution.

Brown stock washing of softwood kraft

THOMAS B. CALHOUN*, MALCOMB B. PINEO** and
DAVID WETHERHORN

Refinement in equipment and in installation methods, as well as improved operating techniques, have eliminated the differences in washing capacity of vacuum brown stock washers, regardless of the type of pulp processed.

TRADITIONALLY, the results to be obtained from any brown stock washer line were thought to be affected by the type of cook given the chips. For example, at one time, design capacities for an easy-bleach southern pine cook were rated at 0.7 to 0.8 tons/sq. ft./24 hours as compared with 0.5 tons/sq. ft./24 hours for a high-yield, hot-refined, pine pulp. With dilution factors of 2.5 to 3.5 lb. of water per pound of air-dry pulp, the soft-cook pine could reasonably be expected to wash below 30 lb. of salt cake per air-dry ton. At the same time, 40 lb. of salt-cake loss on the high-yield, hot-refined pulp was considered as satisfactory operation.

Refinement in equipment and in installation methods, as well as improved operating techniques, have changed this situation so that there is no longer the spread in capacities of pulp or in washing efficiencies between soft-cook pine pulp and high-yield pine cooks. This point is best illustrated by presenting operating data from two mills which are located near enough to each other to insure that they procure similar woods, yet are producing widely dissimilar pulps from this wood.

Two mills which meet this qualification are Brunswick Pulp & Paper Co., Brunswick, Ga., and a north Georgia pulp mill producing liner board. Brunswick produces a high-brightness pulp from pine and hardwoods. The operation at the north Georgia liner board mill is a high-yield cook from softwoods. This discussion will be confined to the pine-washing operation.

Brunswick washing equipment

Washing equipment at Brunswick consists of two lines of Oliver ring valve vacuum brown stock washers, 8 ft. dia. × 12 ft. long. These units are arranged in conventional manner: three drums operating single-stage with repulping between each stage. Each line is preceded by vibratory deknotting screens.

Brunswick departs from the usual arrangement in that each line of three washers is followed by a third intermediate repulper and an 8 ft. by 10 ft. rewasher. In turn, the rewasher is followed by a single-element final shredder, and washed pulp is dropped from this shredder into a high-density storage chest. However, the washing data reported here are confined to the three counter-current washing stages.

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TABLE I

Operating Data — Brunswick Pulp & Paper

Tonnage — 540 AD tons/24 hrs. over the washer on an unbleached basis.
Permanganate number of pulp — 17 to 19 TAPPI (25 ml).
Feed consistency to washer — 1.25 per cent AD.
Discharge consistency from third washer — 13 per cent AD.
Strength of liquor as blown — 22 per cent dissolved solids.
Strength of liquid pumped to evaporator — 15.5 per cent dissolved solids.
Average gpm of hot water applied to third stage — 800.
Pounds of dissolved solids per ton of AD pulp as blown — 2,987.
Dilution Factor — Pounds of water per pound of AD pulp:
(a) Calculated from liquor strength drop — 2.8.
(b) Calculated by water addition and discharge consistency—2.2.
Average chemical loss — Pounds of sodium sulfate per AD ton of pulp — 30.

The salt cake loss determination was made by the Beckman Flame Spectrophotometeric method and samples were taken across the drum face each shift. The dilution factor was obtained in two ways. First, knowing the amount of solids per ton of pulp, it was calculated from the drop in liquor strength between the digester blow and the evaporator feed. It was also calculated from the difference between the gpm of wash applied to the third stage sheet and the gpm leaving with the sheet. The loading across each filter stage averaged 0.9 AD tons/sq. ft/24 hrs. This is compared to a design loading capacity of 0.75 AD tons/sq. ft/24 hours. or approximately a 20 per cent overload.

One factor which markedly affects the washing operation is service tank detention time. It is very important to provide enough time to allow entrained air bubbles to escape from the liquor. Air in the recycled dilution, or shower liquor, will accumulate in the sheet and hamper the uniform flow of wash liquor through the sheet. Uniform continuous operation of a brown stock washer line is desirable, and the operators should have sufficient liquor in the service tanks to assure a smooth start-up and carry them over any momentary disturbances in operation.

The first stage horizontal type service at Brunswick is 20 ft. dia. × 100 ft. long and operates with a 10-ft. feed-liquor level. At the operating feed consistency of 1.25 per cent, approximately 7200 gpm flows down the barometric legs and the detention time of the liquor in the first-stage tank is 15 min. The second-stage service tank is 20 ft. dia. × 100 ft. long with operating liquor level of 10 ft. at the same tonnage and feed consistency. The detention time under these conditions is also 15 min. The third-stage service tank is 20 ft. dia. × 80 ft. long and the operating

(Continued on page 860)

Analysis of a pulp washing system

BRUCE ARMSTRONG

▶ A screw press is capable of delivering a very clean pulp in spite of the relatively low dilution factor.

▶ Displacement washing results in a pulp 3.8 times cleaner, and the effluent is at 12 per cent higher concentration, than in dilution washing when using the same amount of water.

THE MATHEMATICAL ANALYSIS of a washing system entailed such an extremely tedious series of trial and error calculations that it was rarely attempted until Perkins, Walsh and Mappus introduced the concept of the "displacement ratio" (*Tappi* Vol. 37, pp 83-89, 1954).

After the sheet has been formed and the shower water is applied, it is conceived that the shower water forms an interface with the liquor contained in the fiber in the sheet and drives this liquor ahead of it through the sheet and into the effluent, much the same as in a diffuser. Hypothetically, the sheet would contain nothing but shower water, and the soluble solids would all be displaced. Actually, for a variety of reasons, some of the shower water is dispersed in the liquor in its passage through the sheet.

The displacement ratio is defined as the ratio of shower water to the total liquor in the washed pulp. We may consider, then, that the liquor in the washed pulp is composed of a mixture of shower water and a portion of residual liquor at the vat concentration. The displacement ratio will vary with:

1. The dilution factor. Obviously the more wash water used, the cleaner will be the washed pulp; and the effluent will consequently be more dilute and will necessarily require larger evaporators and more steam to evaporate it. A high dilution factor is obviously open to serious objections when the chemical is to be recovered.
2. The absence or presence of entrained air or foam, which interferes with the passage of the wash water through the sheet.
3. The degree of overload on the equipment. When a vacuum washer is operated beyond its rated capacity, its over-all efficiency drops rapidly. Speeding up the drum automatically reduces the time the fiber is under vacuum, and, as drainage is a function of time, it acts adversely.
4. The number of showers and the uniformity with which the wash water is applied over the sheet.

Consider now a typical single-stage vacuum washer in which the pulp has been diluted in the blow-tank to 3 per cent with strong black liquor and pumped to the washer where it is further diluted to 1.25 per cent in the vat. As suction is applied to the drum, a sheet is formed, and a corresponding amount of liquor is discharged as effluent. Let us assume that the pulp "as blown" (after flashing but before dilution) has a consistency of 10 per cent. It would therefore contain 9 lb. of liquor per pound of oven-dry fiber. After dilution to 1.25 per cent in the vat it would contain 79 lb. liquor per pound of fiber. The sheet, at 16 per cent consistency, would contain 5.25 lb. of liquor per pound of fiber.

Expressing the consistency as pounds of liquor per pound of fiber greatly facilitates the calculations. It has been called the wetness-factor and given the symbol "w". A subscript shows the location referred to. Thus, w = wetness factor of the washed pulp; w_v = wetness factor in the vat; w_B = wetness factor "as blown", etc. By subtracting wetness factors we get the extraction per pound of fiber directly. The extraction in the above example is accordingly $w_B - w = 9.0 - 5.25 = 4.75$ lb/lb. The percentage extraction, referred to the "as blown" condition,

$= 4.75/9.0 \times 100 = 52.8\%$; or, referred to the vat,

$= 73.75/79.0 \times 100 = 93.3\%$

In Fig. 1 is shown a single-stage washer. By means of a liquor balance, equating input to output, we can show the quantities involved. In a theoretically perfect washer, all the wash water, W, would reappear in the washed pulp, and W would equal w. In practice, however, some dilution takes place. The dilution factor is defined as that part of the wash water which shows up in the effluent. Hence $W = w + D$ (in which "D" is the dilution in pounds of water per pound of pulp).

$$\text{Input} = \text{Output}$$

$$w_B + (w + D) = w + (\text{Evaporator Feed})$$

$$\text{Evap. Feed} = w_B + (w + D) - w = (w_B + D)$$

Taking a balance around the washer drum:

$$w_v + (w + D) = w + \text{effluent}$$

$$\text{Effluent} = w_v + (w + D) - w = (w_v + D)$$

Taking a balance around the vat:

$$w_B + \text{dilution} = w_v$$

$$\text{Dilution} = (w_v - w_B)$$

Let "S" be the ratio of soluble solids to total liquor; a subscript again denoting the reference point. Thus, S_1 =

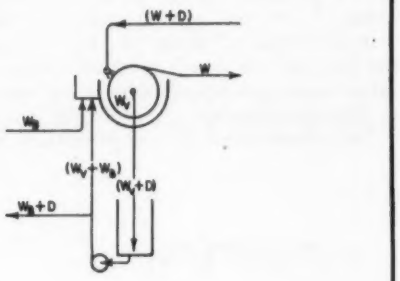

FIG. 1
LIQUOR BALANCE
SINGLE STAGE WASHER

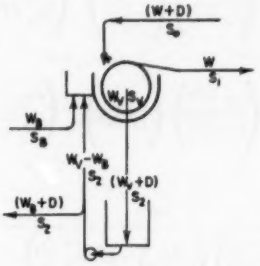

FIG. 2
LIQUOR AND SOLIDS BALANCE
SINGLE STAGE WASHER

solids in the liquor in the washed pulp; S_2 = solids in the effluent; S_v = solids in the vat liquor, and S_B = the solids in the liquor in the pulp "as blown".

w_B and S_B can be determined by taking a sample of the pulp "as blown" and the solids and consistency analyzed in the laboratory. S_1 will then determine the cleanness of the washed pulp and S_2 the concentration of the evaporator feed.

By taking a solids balance and equating input, these can be determined. Fig. 2 repeats Fig. 1, to which the concentrations, S, have been added.*

As fresh water, free of soluble solids, is normally used in the final washer or a single-stage washer, S_o = zero.

The total soluble solids in the washed pulp = $w \times S_1$. This is made up of wash water at concentration S_o and vat liquor at concentration S_v. The quantity of wash water, by definition, = $w \times DR$, in which DR is the displacement ratio. The balance, or $w - w \times DR$, is residual vat liquor. Hence:

$$wS_1 = w \times DR \times S_o + w(1-DR)S_v$$

$$w \times DR \times S_o = o$$

$$S_v = \frac{wS_1}{w(1-DR)} = \frac{S_1}{(1-DR)} \qquad (1)$$

Multiply both sides of the equation by (1-DR)

$$S_v(1-DR) = S_1$$

$$S_v - S_v \times DR = S_1$$

$$DR = \frac{S_v - S_1}{S_v} \qquad (2)$$

For the case when fresh water is used, we have found how to determine the displacement ratio. S_v and S_1 can be sampled and determined in the laboratory. By an analagous method it can be shown that the general form of this equation can be written:

$$DR = \frac{S_v - S_1}{S_v - S_o} \quad \text{when } S_o \text{ does not equal zero.}$$

*(Note: One pound of oven dry fiber should be added to the following equations, but as this will appear on both sides of the equation, they cancel each other out and are omitted for simplicity).

Returning now to Fig. 2, an amount of liquor will be extracted in forming the sheet equal to $(w_v - w)$; and this will be at vat concentration S_v. In the second step an amount of liquor equal to the displacement = w DR, will expel an equivalent amount of vat liquor at concentration S_v. The balance of the wash water, amounting to (w + d- — wDR), comes through at concentration S_o. The total solids in the effluent,

$$(w_v + D)S_2 = (w_v - w)S_v + wDR \times S_v + (w + D - wDR)S_o$$

When fresh water is used S_o = zero, and

$$(w_v + D)S_2 = (w_v - w + wDR)S_v$$

$$S_2 = \left(\frac{w_v - w + wDR}{w_v + D}\right)S_v \qquad (2A)$$

But, from equation (1),

$$S_v = \frac{S_1}{(1-DR)}$$

$$S_2 = \left(\frac{w_v - w + wDR}{w_v + D}\right)\left(\frac{S_1}{1-DR}\right)$$

Taking a solids balance around the system and equating input to output:

$$w_B S_B + (w + D)S_o = wS_1 + (w_B + D)S_2$$

$(w + D)S_o = 0$ when fresh water is used.

$$w_B S_B = wS_1 + (w_B + D)\left(\frac{w_v - w + wDR}{w_v + D}\right)\left(\frac{S_1}{1-DR}\right)$$

$$w_B S_B = S_1\left[w + \frac{w_B + D}{w_v + D}(w_v - w + wDR)\left(\frac{1}{1-DR}\right)\right]$$

Divide both sides by S_B:

$$w_B = \frac{S_1}{S_B}\left[w + \left(\frac{w_B + D}{w_v + D}\right)\left(\frac{w_v}{1-DR}\right) - \left(\frac{w_B + D}{w_v + D}\right)\left(\frac{w(1-DR)}{1-DR}\right)\right]$$

$$w_B = \frac{S_1}{S_B}\left[w + \left(\frac{w_B + D}{w_v + D}\right)\left(\frac{w_v}{1-DR}\right) - \left(\frac{w_B + D}{w_v + D}\right)w\right]$$

$$\frac{S_1}{S_2} = \frac{w_B}{w + \left(\frac{w_B + D}{w_v + D}\right)\left(\frac{w_v}{1-DR}\right) - \left(\frac{w_B + D}{w_v + D}\right)w}$$

Multiply numerator and denominator by $\frac{w_v + D}{w_B}$

$$\frac{S_1}{S_2} = \frac{w_v + D}{w\left(\frac{w_v + D}{w_B}\right) + \frac{w_v}{1-DR}\left(\frac{w_B + D}{w_B}\right) - w\left(\frac{w_B + D}{w_B}\right)} = \frac{w_v + D}{\frac{w_v}{1-DR}\left(\frac{w_B + D}{w_B}\right) + \frac{w}{w_B}(w_v - w_B)} \qquad (3)$$

But $\frac{S_1}{S_B} \times S_B = S_1$, the desired concentration of solids in the washed pulp.

Total solids in washed pulp per air-dry ton:

$$TS/Ton_{AD} = S_1 \times 1800 \times w = \text{lbs./ton}$$

$$\text{Salt cake loss} = TS \times \frac{142}{62} \times 1/4 = \text{lbs. } Na_2SO_4/Ton$$

An example for a typical kraft pulp will make the use of the formula clearer. Assume a kraft pulp with a consistency of 10 per cent "as blown" and containing 20 per cent soluble solids in the liquor; a displacement ratio of 75 per cent and a dilution factor of 3 lb/lb.; a consistency in the sheet of 16 per cent and 1.25 per cent in the vat:

$$\frac{S_1}{S_B} = \frac{79.0 + 3.0}{\frac{79}{0.25}\left(\frac{9.0+3}{9.0}\right) + \frac{5.25}{9.0}(79.0 - 9.0)} = \frac{82.0}{462.1} = 0.177$$

$$TS = 0.177 \times 0.200 \times 1800 \times 5.25 = 334.5 \text{ lbs./A.D. Ton}$$

$$Na_2SO_4/Ton = 334.5 \times \frac{142}{62} \times \frac{1}{4} = 191\tfrac{1}{2} \text{ lbs./Ton}$$

The same formula applies to a displacement press, using care to assume data in the proper range for good press operation. We shall assume a consistency of 5 per cent feed to the press; an output consistency of 40 per cent and a dilution factor of 1.5 lb/lb. Then, all other conditions remaining the same: $w_v = 19.0$; $w = 1.5$ and $D - 1.5$ $DR = 0.75$

$$\frac{S_1}{S_B} = \frac{19.0 + 1.5}{\frac{19.0}{0.25}\left(\frac{9.0+1.5}{9.0} + \frac{1.5}{9.0}(19.0 - 9.0)\right)} = \frac{20.5}{90.4} = 0.227$$

$$TS/ton = 0.227 \times 0.200 \times 1800 \times 1.5 = 122 \text{ lbs./ton}$$

$$\text{Salt cake loss} = 122 \times \frac{142}{62} \times \frac{1}{4} = 70 \text{ lbs./ton}$$

The concentration of soluble solids in the washed pulp, $S_1 = \frac{S_1}{S_B} \times S_B$

For the vacuum washer $S_1 = 0.1777 \times 0.200 = .0354 = 3.5$ per cent; for the press $S_1 = 0.277 \times 0.200 = .0454 = 4.5$ per cent, in spite of a dilution factor of 3 lb/lb. versus 1.5 lb/lb. The big gain, of course, lies in the fact that the crumb from the press contains only 1.5 lb of liquor per pound of oven-dry fiber versus 5.25 lb. in the vacuum washer.

The concentration of the evaporator feed is:

$$S_2 = \left[\frac{w_v - w(1-DR)}{w_v + D}\right]\left(\frac{S_1}{1-DR}\right)$$

$$S_2 = \frac{79.0 - 5.25\ (0.25)\ (.0354)}{(79.0 + 3.0)\ (0.25)} = 0.134$$

and for the press: $S_2 = \frac{19.0 - 1.5\ (0.25)\ (.0454)}{(19 + 1.5)\ (0.25)} = 0.165$

These results are summarized in Table I.

TABLE I

	Dilution Factor	Salt Cake Loss	Evaporator Feed
Vacuum	3.0	191	13½
Press	1.5	70	16½
Vacuum	1.5	213	15.4

Thus it will be seen that the press, by virtue of the inherently high consistency of discharge, is capable of delivering a very clean pulp in spite of the relatively low dilution factor and, in addition, increase the concentration of the evaporator feed.

Semichemical chips and high-yield sulfite and kraft cooks present a problem. Without refining they will not form a sheet on the vacuum washer; and after refining, the reduced freeness of the pulp appreciably reduces the capacity of either a vacuum washer or press. It is suggested that two stages of washing presses be used with a high-density refining stage between presses, but further discussion of this special case is outside the scope of this paper.

It has been seen that one of the big advantages of a press is the low liquor content of the pressed pulp. If, instead of the press referred to above, with a discharge consistency of 40 per cent, we were to use a press with an output consistency of 65 per cent, would not the results be even better? In such a case ,the wetness would be 0.538; and the residual liquor would be at the inlet concentration, "as blown", equal to 20 per cent following the data in the above example.

$$TS/ton = 0.538 \times 0.200 \times 1800 = 194 \text{ lbs./ton A.D.}$$

$$\text{Salt cake loss} = 194 \times \frac{142}{62} \times 1/4 = 111 \text{ lbs./ton A.D.}$$

Multi-stage washing

By an analogous method, formulas for two, three or more stages can be worked out. In this the ratio of concentration of the pulp as discharged to the concentration at the inlet is derived. The flow diagram of a two-stage system is given in Fig. 3.

$$\frac{S_1}{S_3} = \frac{w_v + D}{\frac{w_v}{1-DR}\left(\frac{w \times D}{w}\right) + w_v - w} \qquad (4)$$

$$\frac{S_3}{S_B} = \frac{w_v + D}{\frac{w_v}{1-DR}\left(\frac{w_B + D}{w_B}\right)\frac{S_1}{S_3}\left(\frac{w}{w_B}\right)\left(w_v - w_B\right) - \frac{DR}{1-DR}\left(\frac{w_B + D}{w_B}\right)\left(\frac{w}{w+D}\right)\left(\frac{S_1}{S_3}\right)w_v} \qquad (5)$$

$$\frac{S_1}{S_3} \times \frac{S_3}{S_B} = \frac{S_1}{S_B}, \text{ or } S_1 = \frac{S_1}{S_B} \times S_B$$

$$TS = S_1 \times w \times 1800$$

$$No_2\,SO_4/ton = TS \times \frac{142}{62} \times \frac{1}{4}$$

Calculations were made for the same conditions outlined in Example I, above; and tabulated in Table II.

TABLE II

	Dilution Factor	Salt Cake Loss	Evaporator Feed
Vacuum Washer	3.0	49.5	14.6
Press	1.5	12.5	17.0

Thus, by adding another stage the salt cake loss has been reduced from 191 to 49.5 lb and the concentration of the evaporator feed increased from 13.5 to 14.5 per cent for the washer; and for the press, salt cake loss reduced from 70 lb. to 12.5 lb., with an increase from 16.5 to 17.0 per cent in the evaporator feed.

It will be found frequently that an additional stage of washing will be well justified to improve the cleanliness of the washed pulp, to increase the concentration of the evaporator feed, or both.

If a press stage is to be added to an existing installation, the press should always be placed in the last stage. To illustrate the reason for this, let us calculate the expected performance two ways — first with the press ahead of a vacuum washer, and then reverse the two washers, using the vacuum washer in the first stage and the press in the second stage, using formulas 4 and 5:

Case 1. Press ahead of vacuum washer

$S_1/S_3 = 0.1675$

$S_3/S_B = 0.336$

$S_1 = 0.1675 \times 0.336 \times 0.200 = 0.01126$

$TS = 5.25 \times 1800 \times 0.011 = 106$ lbs./Ton, A.D.

Case 2. Vacuum washer ahead of press.

$$\frac{S_1}{S_3} = 0.121$$

$$\frac{S_3}{S_B} = 0.4375$$

$$S_1 = 0.121 \times 0.4375 \times 0.200 = 0.0106$$

$$TS = 1.5 \times 1800 \times 0.0106 = 28.6 \text{ lbs./ton A.D.}$$

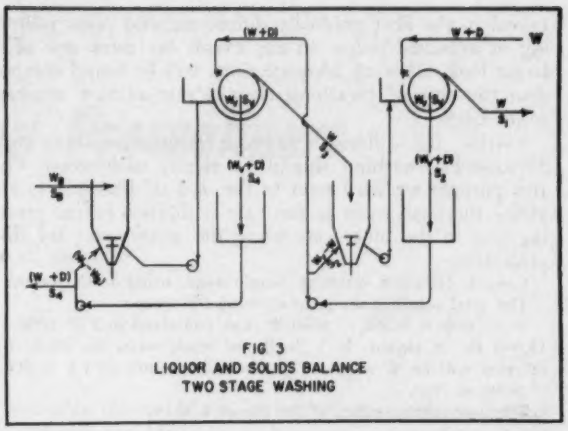

FIG 3
LIQUOR AND SOLIDS BALANCE
TWO STAGE WASHING

It will be noted that S_1 is almost the same in both cases, so that the improvement is due entirely to the low liquor content in the washed pulp.

In Table III all the examples worked out above have been brought together for ready reference.

TABLE III

Type	Dilution Factor	Salt Cake Loss	Evaporator Feed	No. of Stages
Vacuum Wash	3.0	191	13½%	1
Vacuum Wash	1.5	213	15½%	1
Press	1.5	70	16½%	1
Vacuum Wash	3.0	49½	14.6%	2
Press	1.5	12½	17.0%	2
Press-Washer	1.5	106	16.6%	2
Washer-Press	1.5	28½	17.0%	2
Press	0	111	20.0%	1

To improve an existing washing system, one should first determine the displacement ratio for each stage. Normally, it will be found that the first stage in a three-stage system will have the highest displacement ratio and the second stage will have the lowest, with the third stage in between the two extremes. It is felt that this reflects the presence of entrained air and foam, which would appear to be at maximum in the second stage. It would seem plausible that the third stage, containing less soluble solids than the second, might well account for the condition. But then, why should the first stage, although still higher in soluble solids, be the best of all three stages? It has been suggested that this can be explained by the fact that dilution ahead of the first stage is done in the blow-tank where the dilution is added in the bottom cone and the agitation of the pulp is effected with the pulp submerged and air effectively sealed off, whereas the dilution between stages is usually effected by screws and paddles, only too often not submerged to seal off the air. If this is so, then it would be useful to re-slurry the pulp between stages in a device similar to a blow-tank, using care to insure that the agitator is always submerged.

The size of this intermediate tank is of importance. It will be recognized that the diluent, at a lower concentration than the liquor in the pulp, must penetrate the pulp, diffuse into the fibers, come to equilibrium, and diffuse out again. While soda is extremely soluble, its diffusion rate is quite low. A limited number of tests show that the curve of diffusion against time rises rapidly in the first few minutes and then begins to flatten out. It is believed by many investigators that the residual lignin solids re-

tained in the fiber gradually diffuse out and cause yellowing of bleached pulps. In any event, the extra cost of a larger tank, allowing adequate time, will be found cheaper than the cost of bleaching chemicals to remove residual solids later.

Finally, the difference between dilution washing and displacement washing should be clearly understood. For this purpose we shall refer to the data of Example 1, applying the wash water in one case as dilution before pressing and in the other case using the wash water for displacement.

Case 3. Dilution washing, single-stage, using fresh water.

The total solids in the pulp entering the system:

$9 \times 2000 \times 0.200 = 3600$ lb./ton, contained in $9 \times 2000 =$ 18,000 lb. of liquor. If 3 lb./lb. of wash water be used, the dilution will be W-w = 1.5 lb./lb. and amounts to $1.5 \times 2000 =$ 3000 lb./ton.

The new concentration of the liquor will be:

$$\frac{3600}{18000 + 3000} = \frac{3600}{21000} = 0.1713$$

When this is pressed to 40 per cent consistency (w = 1.5 lb./lb.), the pulp will contain 3000 lb. of liquor at a concentration of 17.13 per cent = 514 lb. T.S./ton A.D.

Case 4. Displacement washing, single stage, using 3 lb./lb. of fresh water.

D = 1.5 lb./lb. DR = 75%.

$$\frac{S_1}{S_B} = \frac{20.5}{90.4} = 0.227$$

$$TS = 0.227 \times 0.227 \times 0.200 \times 1.5 \times 2000 = 136 \text{ lbs./lb.}$$

Ratio of solids per ton dilution vs. displacement washing $= \frac{514}{136} = 3.8{:}1$

Ratio of concentration in evaporator feed $\frac{16.5}{14.7} = 1.12{:}1$

Thus, displacement washing results in a pulp 3.8 times cleaner, and the effluent is at 12 per cent higher concentration than in the case when using the same amount of wash water in dilution washing.

Outline of Pulp Washing Practices

(Continued from page 849)

This meant evaporation, which led directly to the need for means to achieve water economy. During the past century many types and schemes had been proposed and tried, but only four have had general acceptance. These are: (1) wash pans, (2) diffusers, (3) vacuum washers and (4) screw presses.

Wash pans came first. Their operation has been described above in the paragraph on the principle of washing by displacement with water. Procedures for effective operation of wash pans were gradually developed, countercurrent washing systems designed, and the operators became very expert. Excellent results, both from the standpoint of thoroughness of washing and water economy were realized, and, in spite of their being very old fashioned, some of these wash pans are still in satisfactory operation. The reason for their going out of style was not so much that the washing was not thorough nor that the dilution was too high, but primarily because of economic factors, especially the considerable space required for an effective wash pan system and the number of experienced operators required to operate them properly.

Next came diffusers. They are really wash pans provided with tight covers and designed to operate under pressure. They could employ a thicker bed of stock and required less time for the washing job. Astoundingly good results have been achieved with diffusers when these devices are of exactly the right size for the charges of pulp they have to accommodate and when operated at a pressure which is just right for the quality of pulp to be processed. Under ideal conditions, the black liquor flowing from the bottom of a diffuser changes abruptly from substantially full digester strength to a very weak liquor. This means very little dilution and a well-washed pulp; in other words, a close approach to the ideal of displacement washing. Unfortunately, this happy occurrence of exactly the right design for the particular type of pulp was the exception rather than the rule. In most diffuser installations, the principle of displacement washing had to be supplemented by dilution washing, particularly in countercurrent systems, and the actual performance fell quite a way short of the ideal of the displacement principle.

Diffusers cannot be spoken of in the past tense. There are a great many of these still in use. But their decline in favor can be laid to the same causes which have made the wash pan almost obsolete; that is, discontinuous operation and high space and labor requirements.

Before leaving the subject of diffusers, I would like to refer to one of the so-far-unsuccessful attempts to build a continuous or semi-continuous diffuser. Any diffuser operator knows that the pulp in the top half of his diffuser is practically perfectly washed while that in the bottom half may contain some fairly strong black liquor. In ordinary diffuser operations, of necessity, the wash water has to continue to travel downward through this bed of thoroughly washed pulp in order to push the black liquor out of the stock in the bottom of the diffuser. An attempt was made to avoid this situation. The idea involved shutting off the wash water supply and removing the thoroughly washed stock from the top half of the vessel. Then the diffuser would be refilled by pumping unwashed stock into it just above the false bottom, and normal washing pressure would be resumed. The attempt was unsuccessful, but it still looks like a good idea.

The vacuum washer is relatively a newcomer in the pulp-washing procedures, although it was not a new machine when it was borrowed from the metallurgical industry. The exact date when the vacuum filter was first employed as a pulp washer may be somewhat indefinite. As far as the writer's experience can determine, the first successful vacuum washer was that installed in the pulp mill of Champion International Co., in Lawrence, Mass., about 1922. The first pulp mill which depended entirely upon vacuum filters for its pulp washing was built by Northwest Paper Co. in Cloquet, Minn., in 1923. In common with wash pans and diffusers, the vacuum filter operates to a considerable extent on the displacement principle, but it falls sufficiently short of the ideal so that supplemental countercurrent dilution washing is the common practice in mills employing vacuum washers.

Since their introduction into the pulp industry a little over 30 years ago, enormous improvements have been made in these vacuum filters so that today, largely because of their continuous operation and high capacity, they are generally considered to be the standard pulp washer.

The latest type of pulp washer to appear on the scene is the screw press. Again, this is not a new device, and attempts to use it for pulp washing date back a good many years. Some have been in service since about 1930 as part of a pulp washing system. Without guaranteeing dates, it may be said that it was approximately 15 years ago that these presses were placed in service as the principal pulp washing equipment in a commercial pulp mill.

As stated in previous paragraphs, it is unlikely that this principle of squeezing the liquor out of pulps can be considered for complete liquor removal. However, it is attractive as an adjunct for dilution washing, if we take the example cited in previous paragraphs, the neutral sulfite

(Continued on page 860)

Progress report on Pressafiners

M. E. GINAVEN and A. H. ADAMS*

▶ Applications of various screw press installations such as pressing of raw and impregnated chips, two-stage press washing, and pressing of aspen chips are discussed.

PRESSURE WASHING with a screw press is an intriguing process that offers many advantages for producers of high-yield pulps.

These machines will express spent cooking liquor at digester concentration and have commercially demonstrated other abilities which result in economic and quality improvements that make screw pressing a pulping concept that must be widely considered. Improved strength at relatively high freeness, greater freedom from shives and faster drying are some of the measurable results that reflect the superior quality of pulp made from material which has received initial fiberizing on a high-pressure screw press.

Commercial establishment of these facts has taken much hard work. Our Pressafiner program, which was started in December, 1952, has taught us the full meaning of Mr. Kettering's comment, "The Price of Progress is Trouble". Our effort to use in the pulp mill a screw press designed primarily for expressing oil from seeds and nuts was almost completely unsuccessful, because such equipment lacked the ruggedness needed to process wood chips. The accelerated rates of corrosion and abrasion encountered under pulp mill conditions of high pressures and elevated temperatures were entirely beyond oil milling experience. Only a tedious and orderly research effort has made it possible to keep commercial operations of some 30 Pressafiners on an economically sound basis. We now have a comprehensive development program well established, for we concur with a recent comment by a Pressafiner user, "The screw press is here to stay — we can't go backward".

Although some unpleasing mechanical experience has been associated with early press installations, we must not lose sight of the fact that the machines have done the job that was set out for them. Actually, establishing the ability to perform basic pulping functions has been one of the most positive results of our endeavor. These basic functions are threefold:

1. Pressing liquids from chips and pulp slurries;
2. Preliminary fiberizing of fibrous aggregates;
3. Producing a steaming effect on material being pressed.

The first function mentioned is, of course, the reason that Dr. Nolan included screw presses in this Conference pulp washing. Pressing is unique among the four generally accepted washing schemes in that it is the one procedure capable of removing substantial amounts of dissolved material from pulp without the addition of water. Although complete removal of soluble solids is not practical, experience has demonstrated that screw pressing is a commercially feasible washing procedure for many applications.

We think that the most practical way to describe these applications and basic screw press functions is to discuss various commercial Pressafiner installations.

Pressing of raw and impregnated chips

First, let us consider pressing of raw chips made from unbarked coniferous slabs for subsequent refining to produce insulating board pulp. This operation requires about 4 hp days per air-dry ton and the O.D. content of the Pressafiner output is 65 per cent. In addition to insulating board, pulp produced in this manner makes superior furnish for wet, dry and semi-dry formed boards.

A second highly successful installation processes northern hardwood chips which have been impregnated with cold caustic. The power used in pressing is about 4 hp days per air-dry ton. Impregnated chips entering the press at 30 per cent O.D. are discharged at 60 per cent O.D. The pulp produced by subsequent refining is bleached and used in the manufacture of book papers.

A third type involves a West Coast hot caustic pulping operation where Douglas fir chips ars pressed after cooking in a Grenco continuous cooker. With a power consumption of less than 1½ hp days per air-dry ton the cooked chips are pressed from 18 per cent O.D. to 70 per cent O.D. After disc refining this material is used in 9-point corrugating medium.

Two-stage press washing

A fourth application is an example of two-stage press washing. Oak chips cooked to about 70 per cent yield by the neutral sulfite process are pressed, rewetted with wash water and pressed again before disc refining. Chips are fed to the first stage Pressafiner at about 45 per cent solids and discharged at 61 per cent solids. After dilution to 30 per cent O.D. the primary press cake is re-pressed to 61 per cent solids. Power consumption is 2 hp days per air-dry ton in each of the two pressing stages. The efficiency of such a system depends upon the volumes of liquid removed in pressing and the soluble solids content of these liquors. With thorough mixing of wash water with the primary press cake, the Dilution Factor for this two-stage system

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will be 1.2 lb. of water per air-dry pound of pulp washed, and 89 per cent of the soluble material entering with the chips will be removed. We wish to emphasize the importance of thoroughly mixing the wash water with the primary press cake to assure an equal soluble solids concentration in the press cake moisture and the press effluent.

Pressing of aspen chips

The last Pressafiner application we will mention is the oldest, that involving the pressing of Aspen chips cooked by the neutral sulfite process. Several mills have such installations. The average power requirement is 2 hp days per air-dry ton, and the pressed material is 60 to 65 per cent O.D. This type of operation has been well described in a paper written by William Nelson, technical director of Green Bay Paper and Pulp Co. Several specific benefits achieved with the Pressafiner installations are listed in this paper. Among these are:

1. An over-all reduction of 20 to 25 per cent in total refining power;
2. An increase of 20 to 30 per cent in headbox freeness while maintaining high stiffness properties,
3. Increased paper machine felt and wire life.

Although the over-all power savings achieved at Green Bay are not realized in all our installations, some power saving is the general experience. From a quality standpoint, the intense pressure and rubbing action which takes place in the Pressafiner produces a superior preliminary fiberizing action. The heat that is generated in combination with the natural or added moisture in the chips provides a steaming effect that produces desirable properties in fibers processed for insulating board, hardboard and mechanical pulp made with presses and disc refiners.

It is evident at this point in our experience that the screw press is a successful device for high-pressure washing and fiberizing and has excellent possibilities for providing superior steaming treatment for dry fiberizing processes.

Bauer Bros. started its Pressafiner development four years ago with experimental runs conducted on a French oil mill screw press. Two modification phases have been completed, and today's equipment has at least double the capacity and stamina of the original models. Even so, we consider our most important objective for further development of the screw press that of making simpler and more dependable equipment.

Outline of Pulp Washing Practices

(Continued from page 858)

semichemical pulp from which 83 per cent of the chemicals can be removed by one pressing, without any dilution whatever. If to this pressed pulp enough water is added to produce a dilution factor of one, that is 1 lb. of water entering the black liquor for each pound of air dry pulp, the resultant cake will contain 29.1 per cent moisture-free pulp. Now, if this pulp is again pressed to 60 per cent dry, 72½ per cent of the remaining solubles will be pressed out. The chemicals remaining in the pulp will be 4.7 per cent of those entering the first washer.

The foregoing is a very brief outline of pulp-washing procedures and equipment of the present and of the immediate past. Other procedures and other types of equipment are currently proposed. It is quite likely that some of the processes and devices tried without commercial acceptance in the past may be revived and may prove successful due to advances in metallurgy and other lines of endeavor, as well as to the changing economy of our nation and the world.

Brown Stock Washing

(Continued from page 853)

level is 10 ft. The liquor detention time of 12 min.

Other miscellaneous operating information on these two lines includes barometric leg diameter 16 in., effective leg drop 32 ft. liquor velocity (liquid only) 11.5 ft. per second; average vacuum first-stage 5 in. of mercury, second stage 8 in. of mercury, third stage 6 in. of mercury; first-stage washer speed 16 sec./revolution, second stage 12 sec./revolution, third stage 12 sec./revolution; hot water temperature 175°F, salt cake makeup for mill, 134 lbs. per AD ton.

The average digester charge when running pine is 4,000 gal. of black liquor, 8,500 gal. of white liquor containing 96 gm. of active alkali per liter, and 44 tons of chips having an average moisture content of 40 per cent. The average cooking time is 3.25 hrs.

North Georgia washing equipment

The washing equipment at the north Georgia mill operating on high-yield kraft consists of three 11 ft. 6 in. dia. × 16 ft. face Oliver ring valve vacuum brown stock washers arranged in series offering three stages of countercurrent washing. Prior to the washers, the chips are passed through one Claflin breaker to break up the cooked chips and prepare them for washing. No preknotting screens are required after this preliminary chip-preparation operation. Following the washers, pulp is discharged into a final shredder where it is broken up for high-density storage before refining in seven Sprout-Waldron disc refiners. Below is a tabulation of the operating data at the liner board mill on the high-yield pine kraft.

TABLE II

Operating Data — Liner Board Mill

Tonnage — 490 AD tons/24 hrs. over the washers.
Permanganate number of pulp at washer — 54 modified TAPPI (75 ml).
Feed consistency to washer — 1.53 per cent AD.
Discharge consistency from third washer — 20 per cent AD.
Strength of liquor as blown — 18.5 per cent dissolved solids.
Strength of liquor pumped to evaporator — 13.0 dissolved solids.
Number of pounds of dissolved solids per ton of AD pulp in liquor as blown — 2,315.
Average gpm of hot water applied to third stage — 550.
Dilution factor — pounds of water per pound of AD pulp:
(a) Calculated from liquor strength drop — 2.7.
(b) Calculated from pounds of water to third washer — 2.7.
Average chemical loss (pounds of sodium sulfate per AD ton of pulp) — 23.6.

The salt cake loss determination was made by ashing a sample from each shift taken across the face of the last stage washer and using the TAPPI uranyl acetate method.

The loading across each filter stage averages 0.85 AD tons/sq. ft./24 hrs. The first stage service tank is a horizontal tank 16 ft. dia. × 66½ ft. long and operates with a liquor level of 8 ft. At the operating feed consistency, 6,350 gpm flows down the barometric leg, and the detention time in the first-stage tank is 7.9 min. The second-stage service tank is 16 ft. dia. × 57 ft. long, and the detention time is 6.8 min. The third-stage service tank is 16 ft. dia. × 57 ft. long, and again the detention time is 6.8 min.

The ring valve washers at the paperboard mill are equipped for two-stage washing, although both washing stages of each drum are piped to the same service tank. The ring valve filter is unique in the respect that two-stage washing may be obtained on the drum with only a very minor valve adjustment. The advantages to be obtained from running the unit with a two-stage valve setting although passing the wash through the sheet only once per stage include the following:

(Continued on page 863)

Organic coatings for paper

Part IX — Other vinyl type coatings: Polyvinyl acetals, Vinylidene chloride copolymers, Polyethylene, Polystyrene, Acrylic Resins

▶ **The complete series of articles on paper coatings will be available in booklet form upon its completion after March, 1957.**

FOR THE PURPOSE of this discussion a vinyl type resin will be considered as one obtained by the polymerization of a carbon to carbon double bond, with the exception of rubber and rubber derivatives. Thus, in this category are polyvinyl acetals, vinylidene resins, polyethylenes, polystyrenes, acrylic resins and allyl resins. None of these resins is used as extensively as polyvinyl acetate or the polyvinyl acetate-polyvinyl chloride copolymer already discussed.

Polyvinyl acetals

Polyvinyl acetals are obtained by reacting aldehydes such as formaldehyde, acetaldehyde and butyraldehyde with polyvinyl alcohol. Ordinarily, the starting material is polyvinyl acetate, which is hydrolyzed to the alcohol and reacted with the necessary aldehyde. These resins are expensive and are used primarily in the preparation of glass "sandwiches" from which safety glass windows are fabricated. Their use here depends upon their high degree of transparency, good adhesive qualities for glass and excellent oxidative and light stability. The polyvinyl acetals, on the other hand, do not have very good resistance to moisture vapor transmission and are unstable in the presence of strong acids and alkalis.

The polyvinyl formals and acetals are used to only a very minor extent in the paper coating field. Polyvinyl butyral, which is soluble in alcohols and esters and, to some extent, in hydrocarbons, provides tough thermoplastic coatings which are useful where strong heat seals are required. Of particular interest is the use of polyvinyl butyral in the lamination of paper to cloth. Ordinarily, the application is made from solvent, although hot melt coating is also possible. Polyvinyl butyrals are available also in water dispersion.

Vinylidene chloride copolymers

Vinylidene chloride copolymers are better known under the name of saran. Vinylidene chloride copolymer is prepared by the polymerization of 1, 1-dichloryl-ethylene. A tough polymer results with a softening range in the region of 130°C. Unsupported films of this polymer are highly transparent and are gaining great popularity in the food packaging field. Such films demonstrate good resistance to moisture vapor transmission and are odorless, tasteless and nontoxic. They have excellent chemical resistance. Also, some of these films have the unique property of shrinking when subjected to relatively mild heat.

Numerous varieties of vinylidene chloride copolymers are manufactured. The variations depend not only on molecular weight, but also on the fact that vinylidene chloride may be copolymerized with other vinyl monomers such as vinyl chloride, vinyl acetate, acrylonitrile, and acrylates.

Such polymers may be applied from organic solvent solution and also as water dispersions. Methyl ethyl ketone is an active solvent for most vinylidene chloride copolymers. Butyl acetate and aromatic hydrocarbons serve as diluents, as do chlorinated hydrocarbons. Since the resin tends to swell in the presence of solvent, solution is somewhat difficult and is best accomplished by adding the powdered form of the resins slowly to the solvent with agitation. Slight warming (without contact with flame) will help.

One of the most effective plasticizers for vinylidene-type polymers is dibutyl phthalate. Tricresyl phosphate and triphenyl phosphate are also valuable, as are dibutyl sebacate and rosin methyl esters.

Pure phenolics, rosin esters, polystyrenes, certain acrylates and certain vinyl copolymers are compatible with vinylidene polymers. However, even small additions of either plasticizers or modifying resins greatly reduce the barrier properties of saran coatings.

Lacquers based on vinylidene chloride copolymer resins may be applied to paper by knife coating or by roller coating. Brush and dip coating is also possible. Ordinarily, approximately 14 lb. of resin per 3000-sq. ft. ream are applied.

As with the other vinyl resins, high drying temperatures are required. It is recommended that the drying temperature be increased gradually from 95°F to 300°F over a period of approximately 2 min. In the final zone, the coating should be subjected to a flash bake of approximately 10 sec. at 500°F. Obviously, such high temperatures of drying will tend to weaken the paper. On the other hand, paper coated with vinylidene chloride copolymer resin demonstrates excellent resistance to moisture vapor transmission and good resistance to acids, alkalis and chemicals. This, of course, is important for such uses as cap liners.

The low moisture vapor transmission properties make such coatings of great interest in the packaging field, and this usage is facilitated by the ability of the resins to heat seal. For low temperature flexibility, 10 to 15 per cent of plasticizers may be added, although this means a sacrifice in moisture vapor resistance.

It is very important when applying vinylidene chloride copolymer resins from solvent solution to use iron-free equipment, since iron tends to cause gelation of solution.

Water dispersions of saran or saran-type polymers are available in solids contents as high as 55 per cent. These latices may be modified by the addition of plasticizers and stabilizers and resins which are first emulsified to make them compatible with the latex.

One latex which is available is based on a copolymer of vinyl chloride and vinylidene chloride. The resin itself has a melting point of 164°C and demonstrates excellent resistance to deterioration by heat and light. It is also nonflammable. In dispersion form it has a solids content of 50 per cent and a pH in the region of 8. The dispersion has a very low viscosity of 20 centipoises, for which reason it usually must be thickened prior to application. Plasticizers effect thickening as does Methocel. Casein and α-protein are valuable stabilizers but do not thicken the emulsion. The emulsion is compatible with numerous other emulsions of vinyl, acrylic and other resins, as well as with a variety of plasticizers. This material is recommended as a paper coating but requires the same high-temperature drying as do other vinyl type coatings.

Saran coatings are usually applied at a ream weight of 20 to 40 lb.

Polyethylene

The use of polyethylene as an additive for paraffin and microcrystalline waxes has already been mentioned. In addition to this application, however, polyethylene is also used as a coating for paper and paperboard.

Polyethylene is produced by polymerizing ethylene gas under conditions of high temperature and high pressure. Waxy, translucent resins result which are thermoplastic and inherently flexible. The viscosity of these resins is ordinarily very high, although lower molecular weight materials are now available. Because of their thermoplastic nature, these resins provide heat-sealing coatings, although in general heat-sealing temperatures are rather high when compared to wax coatings. Once formed, however, the seal is quite strong. Polyethylene is insoluble in all common solvents at room temperature. It will, however, dissolve at elevated temperatures in chlorinated solvents and in aromatic and aliphatic hydrocarbons.

In general, polyethylene is not highly compatible with other resins or chemical materials. Hydrocarbons such as diamyl naphthalene and certain terpene polymers are compatible and may be used as plasticizers. Coumarone and coumarone-indene resins are also compatible. Also, polyethylene may be compounded with certain waxes and with some synthetic rubbers. Low-molecular weight polyethylenes are, of course, more compatible. Recently, a grade of polyethylene has been announced with a molecular weight in the range of 1000 to 2000. This material is compatible with modifiers such as ethyl cellulose, hydrogenated castor oil, most plasticizers, polyisobutylenes, low-molecular weight polyvinyl acetates, rosin esters and all waxes.

The general lack of compatibility and solubility of most polyethylenes makes their chemical resistance excellent. Because polyethylenes are thermoplastic in nature, however, they do not resist heat well.

Several procedures are availalbe for applying polyethylene to paper. One procedure makes use of the extrusion of the resin in a thin film at 500-600° F directly to the paper as the paper passes under the extruding mechanism. This type of lamination makes possible a high output rate as well as good control of range of thickness. It also permits the coating of paper which contains punched holes for windows of the type which are highly desirable in many packaging applications. Since the adhesion of the extruded molten polyethylene is excellent, no laminating adhesives are required. Adhesion depends largely on temperature rather than pressure, and the actual temperature at the point of lamination is usually in the range of 400-500° F. A roll pressure in excess of 100 lb. per inch is generally not required.

Extrusion temperature has a great effect on the degree of oxidation of the extruded polyethylene film. Since oxidation improves adhesion of the film to the substrate but impairs the film's heat-sealing properties, good extrusion coating results have been obtained by using an inert atmosphere, such as nitrogen for instance, to exclude oxygen from the outer side of the film while leaving the substrate side of the film in contract with atmospheric oxygen to obtain good adhesion.

The hot melt coating of polyethylene is also possible, especially when antioxidants are included in the formulation. By this method very thin films may be applied. As indicated above, several grades of low molecular weight polyethylene have recently been announced with melting points as low as 82-97° C. These low molecular weight types may be coated by hot melt procedures on reverse roll coaters and, in some instances, on conventional waxing machines. The coating must be applied at temperatures ranging from 200-300° F, depending on the flow viscosity of polyethylene and the thickness of coating desired. If a high quantity of wax is present, the lower temperatures may be used.

For solution coating, it is of course necessary to use hot solutions, since polyethylene tends to gel in virtually all solvents at room temperature. Equipment required here includes, of course, a heated container for polyethylene solution. Actual application can be made by any of the means ordinarily used to coat solutions. Coatings of 6 to 22 lb. per 3000-sq. ft. ream have been applied by solution methods.

Polyethylene-coated papers are valuable for the fabrication of multiwall paper bags and as liners for large fiber drums. They also find application as wrappings for frozen foods.

Multiwall bags lined with polyethylene-coated paper make possible the shipment of many materials which previously had to be packaged in more substantial, and more expensive, types of packages. Among the materials now packaged in multiwall bags containing polyethylene coatings are fertilizers, ion exchange resins, cements, peat moss, phosphate, silica gels, brown sugar, compost, detergents, monosodium phosphate, quicklime, dried milk and casein. Specialty packages for arctic and tropical use may also be based on polyethylene-coated paper.

Polystyrene

Chemically, styrene is vinyl benzene, and thus polystyrene is related to other polyvinyl compounds. Actually, polystyrene is one of the less expensive polymers, and, like other vinyls, it is thermosplastic. It softens in the range of 88-120° C, although some high molecular weight grades may have considerably higher softening points. Polystyrene is quite brittle, and does not have the strength characteristics of other vinyl resins. It does, however, have excellent chemical resistance and outstanding resistance to alkali, waste, solvents and oil. Its dimensional stability and electrical insulation properties are good. Films are not impermeable to moisture vapor,

but they do act as waterproofing agents. The use of polystyrene as such in the paper coating industry is limited since solutions of the resin have very high viscosities. The high-viscosity index of the resin also makes application by hot melt difficult. The low specific heat of polystyrene presents problems in making it adhere to paper.

Polystyrene is soluble in aromatic hydrocarbons, chlorinated hydrocarbons, esters and ketones. Solutions have been used for impregnation of paper in order to achieve stiffness.

Styrene polymers are now available as water dispersions. Usually these are copolymers with butadiene or with maleic anhydride. In the latter instance, because of free carboxyl groups, an alkali-soluble copolymer results. Butadiene-styrene copolymers, of course, have attracted wide attention as vehicles for emulsion paints. Water dispersions of this type, however, may also be used for paper coatings. (See Part X in this series.)

Styrene latices or styrene latices mixed with butadiene styrene copolymer latices have been recommended as coatings for wallpaper to make the surface washable. The incorporation of a small amount of paraffin helps to increase water resistance. Since gloss is usually not desired with wallpaper, flatting pigments can be added. Styrene latices have also been used to coat cardboard for the fabrication of cartons which can be re-used several times. Here the high degree of abrasion resistance offered by the coating is extremely valuable. Such latices have also been recommended for use with the starch and casein coatings previously discussed under the section on coatings.

Polydichlorostyrene is even less soluble than styrene. Because of its excellent electrical properties, however, it has been suggested as a coating for electrical insulating papers.

Acrylic resins

Acrylic resins provide films which have excellent clarity, light and heat stability, and a high degree of toughness. Arcylic films are usually highly flexible, although they have a tendency to be somewhat soft and tacky. Also, they are not as outstanding as the other vinyl resins from the point of view of resistance to chemicals, oils, greases and water vapor. Acrylic resins are fairly expensive, although their cost has decreased as applications in emulsion paints have grown.

Acrylic resins are soluble in many organic solvents including hydrocarbons, ketones, esters, ether alcohols and chlorinated hydrocarbons. They are also soluble in some aliphatic hydrocarbons.

Acrylic resins are campatible with nitrocellulose, cellulose acetate and ethyl cellulose. They are readily plasticized, when plasticization is needed, by esters such as dioctyl phthalate and dibutyl sebacate.

Monomers for acrylic resins are low molecular weight alcohol esters of acrylic or methacrylic acids. Properties, of course, vary with the chain length of the esterifying group and with the molecular weight.

Acrylic resins may be coated from solution or from hot melt as well as from water dispersions. They have good heat-sealing properties, and resistance to moisture vapor transmission may be improved by the addition of wax. Wax also serves to improve the blocking resistance characteristics of the film. Acrylic films ordinarily demonstrate excellent aging properties. Water emulsions are used for the impregnation of paper to develop a high degree of toughness and tear resistance. In this regard they are generally superior to rubber latices. Applications of this type involve the impregnation of paper to obtain a leather-like material for use as shoe inner soles.

A typical hot melt coating formulation may be based on the polymer from n-butyl methacrylate. This material may be formulated with paraffin, hydrogenated castor oil and a plasticizer such as butyl phthalyl butyl glycollate (Santicizer B-16).

Certain acrylic emulsions, when applied at coating weights as low as 1.9 to 2.4 lb. per 1000 sq. ft. of paper, impart greaseproofness to board.

Brown Stock Washing of Softwood Kraft

(Continued from page 860)

1. On a start-up with a bare face wire (no pulp on the face wire) much of the air which would normally be pulled into the vacuum system on a single-stage valve setting, thus adversely affecting the formation vacuum, is piped down the secondary leg. This facilitates the initial sheet pickup.

2. The washing cycle is extended to a point 26½° on the descending side of top center rather than being cut off 7° on the rising side of top center. This setting minimizes runback of liquor into the washed pulp sheet from the section as more drainage time is permitted to remove the liquor from the section.

3. Wash liquor may be applied over a longer arc of the drum periphery because vacuum is extended the additional 33½°.

Miscellaneous operating data here include: Main barometric leg diameter 16 in.; secondary leg diameter 4 in.; effective leg drop 35 ft.; liquor velocity (liquid only) 11.15 ft. per sec.; average vacuum, first stage, 6 in. of mercury, second stage 7.5 in. of mercury, third stage 7 in. of mercury; first-stage washer speed 34 sec./revolution, second stage 34 sec./revolution, third stage 28 sec./revolution; hot water temperature 160°F; salt cake makeup for mill, 115 lb./AD ton.

The usual digester charge on high-yield pine is 3,824 gal. of black liquor, 5,426 gal. of white liquor containing 0.94 lb. of sodium oxide per gal., 38 tons of chips containing an average moisture of 48 per cent. The average cooking time is 120 min.

Comparison of washing results

At the liner board mill, average yield in tons of pulp per digester is 11.75 AD tons and the yield on the basis of produced board 60 per cent. At Brunswick Pulp & Paper the average yield in tons of pulp per digester is 10.28 AD tons and the yield on the basis of finished baled pulp 43 per cent.

It is readily apparent that there is no fundamental difference in the washing results obtained at these two mills. The small spread in washing efficiency may be in large measure attributed to the heavier loading of the washers at Brunswick. Both mills, however, show excellent operation of their vacuum brown stock washers, indicating that equally good results can be expected regardless of the type of pulp produced if the units are properly installed and operated.

*There must be reasons for leadership**

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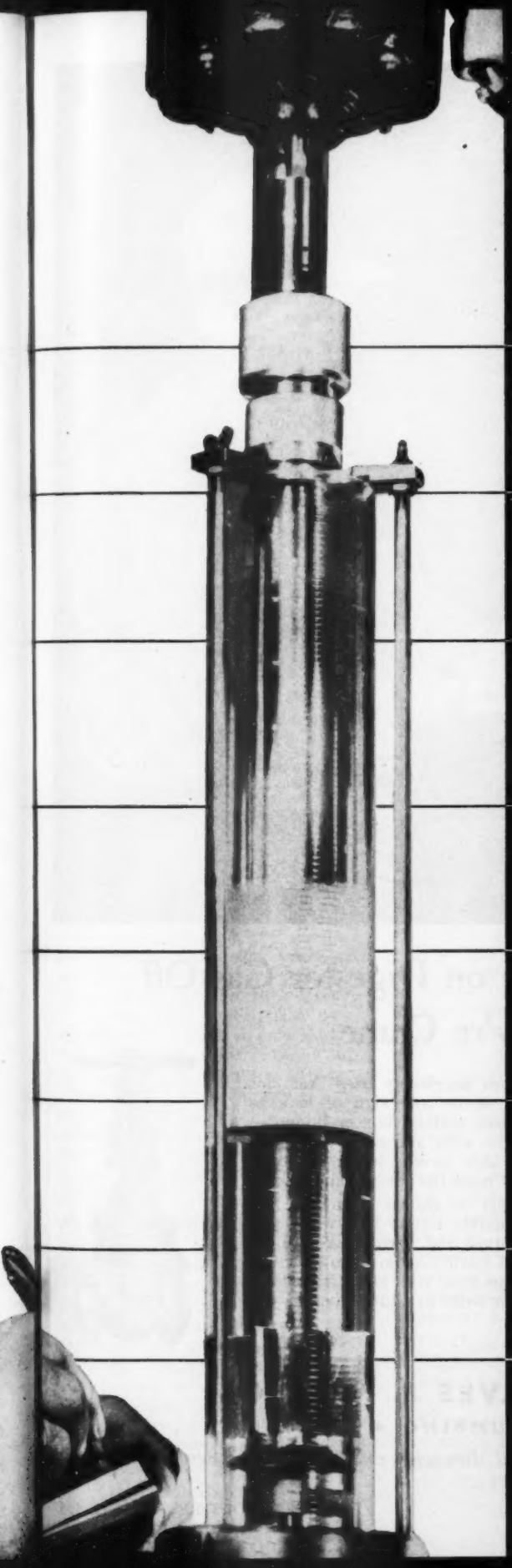

SOME REASONS FOR HERCULES LEADERSHIP

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A staff of more than 50 technically trained men are thoroughly grounded in the cumulative experience of 40 years' mill and laboratory service to the paper industry. Such company experience results in an understanding of the requirements of the paper industry and is reflected in the variety and dependable quality of the products designed to meet them. One of these men is always as near as your telephone.

FORWARD-LOOKING CHEMICALS

From Hercules research come new products designed to anticipate your needs for improved chemical materials. Whether it is a new grade of size based on rosin or a completely new concept, you can look to Hercules for progressive leadership.

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Hercules maintains by far the largest number of plants and strategically-located distribution points of any rosin size manufacturer. This is your assurance that the product you want will be delivered when and where you want it.

A SIZE FOR EVERY NEED

Hercules' large number of sizing grades means there is one available to meet practically any requirement. For unusual problems, Hercules can formulate a custom-made grade to fit your specific need. Hercules assures you the lowest possible sizing cost by recommending the right grade for your specific needs.

PACE-SETTING RESEARCH

The most extensive research and technical service facilities devoted exclusively to papermaking are maintained by Hercules. The Hercules laboratories are always at the disposal of customers in helping to solve sizing and other papermaking problems.

HERCULES HELPS MILL OPERATIONS

Hercules has assisted in the industry's progress by designing mechanical improvements and testing equipment. The development and extensive use of the Hercules Automatic Emulsifier, for example, has resulted in major economies in the handling of rosin size.

VARIETY OF PRODUCTS

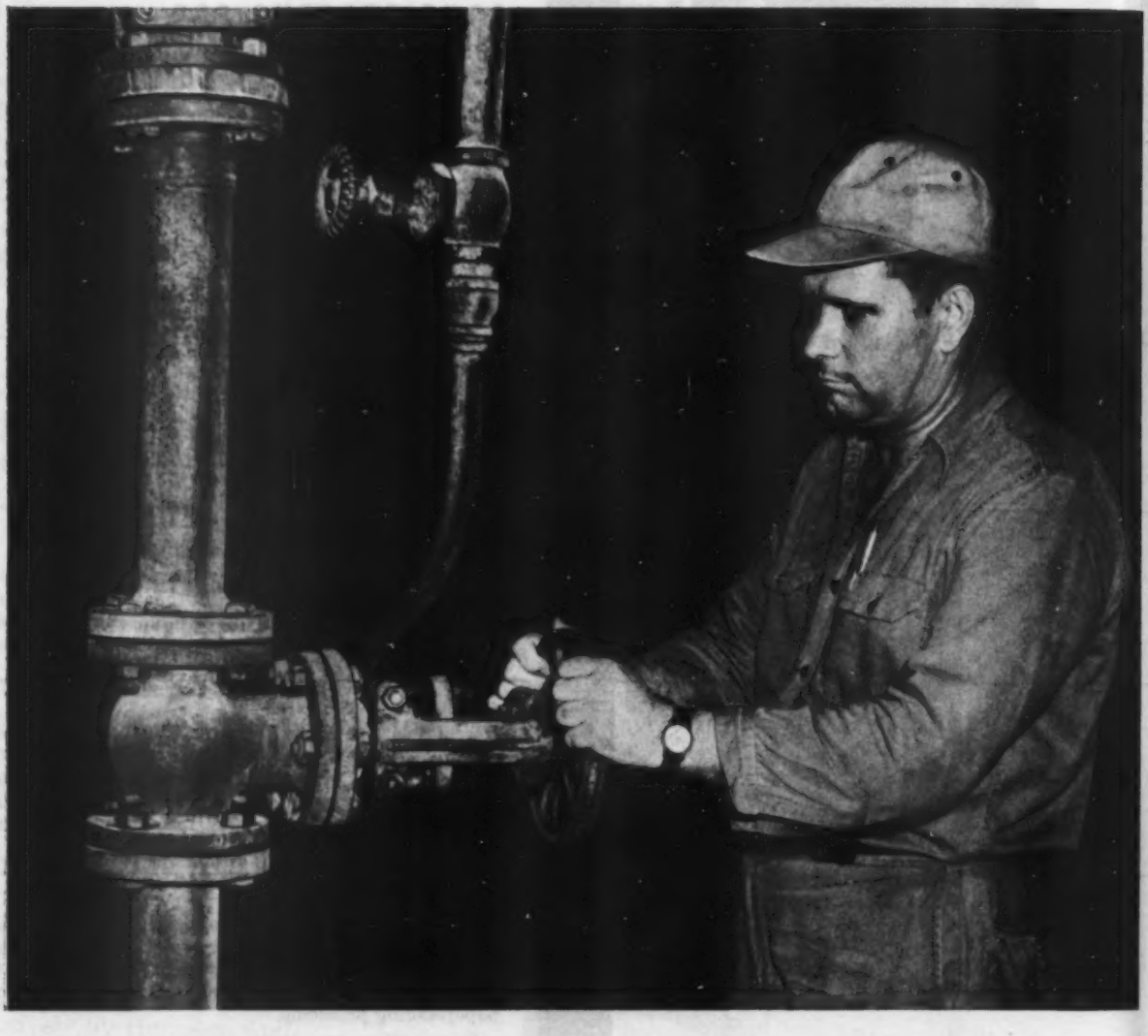
Hercules is also a leading source of other high-quality papermaking chemicals. Wax emulsions, wet strength resins, defoamers—to name but a few made by Hercules—incorporate the same degree of skilled processing improvements that are found in Hercules'® rosin sizes.

DEPENDABLE SOURCE OF SUPPLY

Hercules' many facilities for producing rosin and rosin size assure you of a thoroughly dependable source of supply.

SAVINGS IN SHIPPING

Hercules has pioneered many improvements in rosin size distribution. The freight and handling savings made possible through the introduction of dry size and higher solids paste size, both in tank truck and tank car shipments, are typical examples.



Better Valve Performance on Digester Gas-Off —because they're Crane

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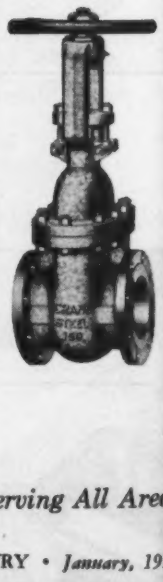
The Crane 3-inch No. 47XR cast steel gate valve you see is one of several on digester gas-off service. It's a severe and exacting service—the valves are used to relieve liquor and turpentine vapors from the digesters, operating at 383° F. temperature at 100 psi.

The Crane gate valves have been in this service much longer than any of the other make of valves previously used. Yet, not one of them shows any sign of leakage around the seat, stuffing box or bonnet—closure is tight, sure and easy. From all appearances, they have a long way to go before they'll need the maintenance crew.

You're smart to choose from the big, broad, dependable Crane line when you order any valves and fittings. You're assured of finest quality at no extra cost. Get full information from your local Crane Representative, or write to address below.



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CURRENT COMMENTS

Overexpansion and cross currents . . . mergers again . . . and another record

The problem of overcapacity in the paper industry continues to be a question widely discussed in both industry and financial circles. A year-end survey by a New York financial publication, however, says that there are cross currents in the industry. After reviewing the increase in capacity during this year and scheduled for the immediate future, this survey says there are many factors which would offset the expansion in production. These were listed as the steady growth in overseas demand not met by the comparatively limited possibilities of Scandinavia, development of new markets, new uses for paper at home and prospects for a continued high level of advertising expenditures, all resulting in a greatly increased demand in the newspaper and magazine fields.

A most authoritative statement was made by David L. Luke Jr., president of the American Paper & Pulp Association and of West Virginia Pulp & Paper Co., in a formal talk to the Salesmen's Association of the Paper Industry. While he pointed out possible danger to the industry in overexpansion of plant capacity, he said that he was more concerned about its timing. That the industry faces a challenge to its salesmanship led him to say that, "it is a matter that calls for industrial statesmanship by members of the industry to keep the pace of expansion disciplined and orderly and in tune with the growth of the markets."

In financial circles the talk of overexpansion has resulted in some marked recessions in the market prices of various paper industry securities. One outstanding Wall Street house says, however, that the price adjustments of principal paper securities have been to more realistic levels, and purchases at present levels should work out well in the long pull.

Mergers: labor too

The merger situation has now reached the field of labor. While the Washington authorities have taken action in various cases involving consolidations of paper companies, the two paper mill unions are about to be combined. Discussing the pending consolidation of the International Brotherhood of Paper Makers (Federation of Labor) and the United Paperworkers of America (C.I.O.), William Schnitzler, a labor union leader said:

"Major pulp and paper corporations, themselves undergoing a rash of mergers in the last four years, will have to face a stronger array of union forces in pending collective bargaining negotiations."

The new union will be known as the United Papermakers and Paperworkers International Union, A.F.L.-C.I.O.

In the labor field a four-month-old strike of employes at the Mechanicville, N.Y. plant of West Virginia Pulp & Paper has been ended by union acceptance of a company offer. A total of more than 900 workers are back at work after losing $1,500,000 in wages and causing a tonnage production loss of more than 25,000.

On the company side, Scott Paper Co. has filed a strong denial of the Federal Trade Commission charges that it has a dominant or leading position in the paper products industry. The FTC cited Scott's acquisition of Detroit Sulphite Pulp & Paper Co. of Detroit, Soundview Pulp Co. of Everett, Wash., and Hollingsworth & Whitney Co. of Boston. Two of these companies have no material previous record of production in the field where Scott is best known.

The Department of Justice has filed suit in the Federal District Court at Toledo, Ohio, to break up the recent merger of National Container Corp. and Owens-Illinois Glass Co. The defendants say that the complaint is unjustified in that the two companies have never been in competition, and the merger merely allows the glass company to go back to the woods for the manufacture of container board in which to package its glass products.

Hudson Pulp & Paper Corp. and Groveton Papers Co., together with Pepsi-Cola, Coca-Cola, General Foods, P. Lorillard and other such companies, have filed a joint denial with government agencies to the charge that their radio and TV promotional activities are in violation of the Robinson-Patman Act. The complaint alleges that payments for advertising time included indirect payments for in-store promotions of their products.

Meeting in Rome

"Particle board", a material not listed in the "Dictionary of Paper", is one of the grades of paperboards which will be discussed in Rome in late January and early February by two United Nations agencies, the Food & Agriculture Organization and the Economic Commission for Europe. The international meeting will be devoted to technical problems involving insulation board, hardboard and particle board. The meeting is expected to result in a broad interchange of information on techniques and processes and the probable future trend in use of these commodities. It is hoped to provide guidance for those considering entry into this business, particularly by helping in the economic development of the less industrialized areas of the world. Those in attendance will include agencies concerned with development programs such as financing, forest products laboratories, public forestry, manufacturers of papermaking equipment and trade associations interested in these fields. Experts from some 20 countries are expected to attend.

All records smashed

With final figures yet to be compiled, it is certain that all papermaking records have been broken in 1956. However, the tremendous surge of the early months has tapered off somewhat in later quarters. At the end of the first quarter production was 12.2 per cent ahead of the comparable quarter in 1955, but the production was only up 9.1 per cent at the end of June and 6.7 per cent at the end of September.

(Continued on page 871)

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BRIGHTER THAN EVER!—MicroRold stainless steel Type 430 in the NEW Bright Finish is now immediately available in sheets up to 48" wide offering new usefulness and economy in stainless fabrication. Produced with the same micro-accuracy of gauge for which MicroRold 36" is well known, Type 430 Bright up to 48" wide gives greater latitude in applications for quality stainless steel.

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WATER COLOR PAINTING BY L. J. A. NEESE

NEW FOUNDRY at Beloit Iron Works: view from core rooms toward dryer and roll-casting shops. Foundry expansion, including melting, molding, and sand system facilities, provides 100,000 additional square feet and doubles Beloit foundry capacity.

Current Comments . . .

Rising costs apparently have not been offset by higher prices, but while prices remain firm there is little chance that consumers will accept further increases.

Financial Reports

Paper mill securities suffered with other Wall Street issues as a result of the November developments in the Middle East.

Net Incomes

A. P. W. Products Co. Inc.—Net nine-month income for the period ended September 30, $165,499; a year ago, $105,478.

Champion Paper & Fibre Co.—Net three-month income for the period ended September 30, $3,677,149; a year ago, $2,980,-475.

Oswego Falls Corp.—Net income for the nine months ended September 30, $1,603,-419; for the same period last year, $1,749,-135.

Stock and Bond Quotations

New York Stock Exchange — Stocks

Closing Prices	Dec. 10, 1956	Nov. 9 1956
A.P.W.	4¼	5⅜
Celotex	38⅛	39⅛
Same Pref.	17¾	18⅞
Certain-Teed	10⅞	11⅛
Champion P & F	36	38½
Same Pref.	95⅞	96
Chesapeake Corp.	31¼	35
Container Corp.	19⅞	21½
Same Pref.	97⅜	—
Crown Zellerbach	54⅜	56
Same Pref.	*94½-95½	96
Dixie Cup	51¼	53
Eastern Corp.	29⅛	28¾
Federal Paper Board	34⅛	32⅛
Same Pref.	*19-19⅛	19⅝
Fibre Paperboard	32¼	31¼
Same Pref.	*100½-103	—
Great Northern	83	85
Hammermill	34¾	38¾
International	*106⅞	109
Same Pref.	*87-88¼	95½
Kimberly-Clark	43½	43½
McAndrews & Forbes	38¼	39½
Marathon	33	32¼
Masonite	33¾	35½
Mead Corp.	36¼	39
Same Pref.	*87-89	—
Minnesota & Ontario	33⅛	33¾
Oxford Paper	42	43⅞
Same Pref.	*91-93½	95¾
Rayonier Inc.	32	31⅝
Riegel	33½	35
Scott Paper	58⅜	65½
Same $3.40 Pref.	83¾	88
Same $4.00 Pref.	94	—
St. Regis	41⅛	47¾
Same Pref.	*95-97	98½
Sutherland	36¾	40¾
Union Bag-Camp	34⅛	36
United B. & C.	22¼	23¾
United Wallpaper	6¾	7¼
Same Pref.	*14½-15	15
U. S. Gypsum	58	61¾
Same Pref.	*156-157	160
W. Va. P. & P.	47¼	49½
Same Pref.	*104-105	—

New York Stock Exchange — Bonds

A.P.W. 5%	—	83
Champion P. & F. Co. 3¾%	—	99½
Champion P. & F. Co. 3%	—	—
Mead Corp. 3%	—	—

American Stock Exchange — Stocks

American Writing	22¾	—
Brown Company	16¾	17⅞
Puget Sound	16⅜	18⅜

*Closing Bid and Asked Prices

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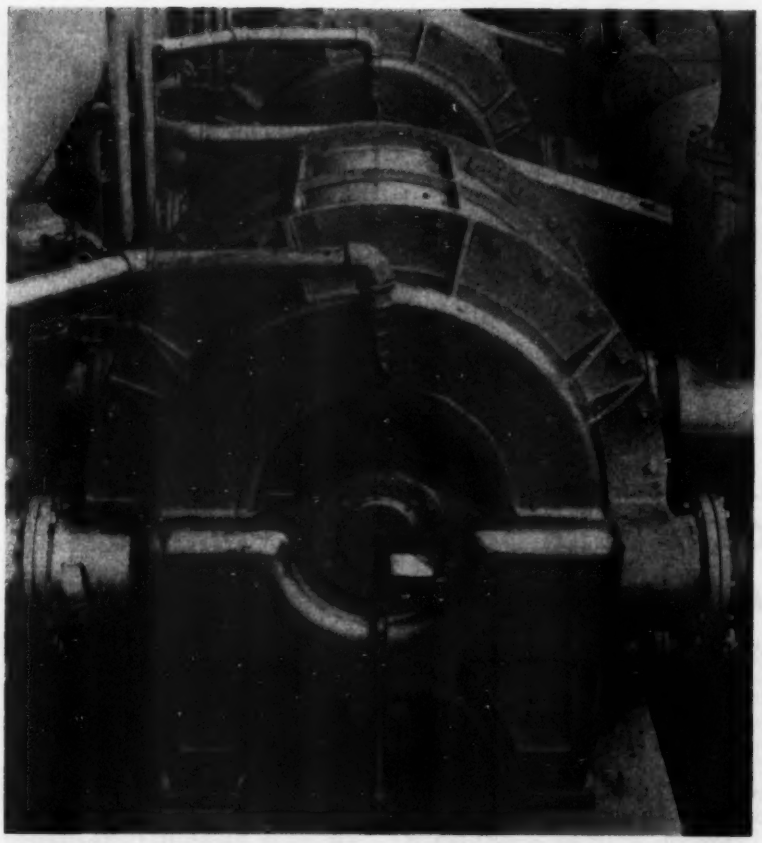

Air from the suction rolls on paper machines carries with it substantial quantities of moisture. This considerably reduces the effective air handling capacity of any vacuum pump except the Nash. In the Nash Vacuum Pump, because of the unique principle of operation, the bulk of this vapor is effectively condensed inside the pump. The total capacity of a Nash is therefore increased.

When you specify a Nash Pump it can be closely sized to the job. It is not necessary to select an over-sized unit, because the rated capacity of the Nash may be relied upon.

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NEWS of the INDUSTRY

FROM ELK FALLS, where noodle pulp is loaded by overhead conveyor, to . . .

THE NEW Antioch mill, the pulp tanker "S. S. Duncan Bay" is a ship on-the-go.

Unique pulp tanker in operation . . .

CZ to Build $8,000,000 Plant at Antioch; Start-Up Set for Summer

AN $8,000,000 plant at Antioch, Cal., for the production of household tissue and toweling, napkins, bags and specialties has been announced by Crown Zellerbach Corp. Construction is set for early 1957. It is expected that the plant will be in operation by summer.

Now in operation at Antioch is the recently completed $18,500,000 kraft paper mill and a $2,500,000 multiwall bag plant. Under construction is a $3,000,000 operation for the production of boxes for the Gaylord Container Div.

Pulp for the California kraft paper mill is shipped from Crown Zellerbach Canada Ltd.'s plant on Vancouver Island, B. C. The carrier is a unique pulp tanker.

The *S. S. Duncan Bay* pumped its first pulp into Antioch in October and thus closed a production system that begins in the forests of British Columbia, pauses momentarily in Elk Falls, B. C., and in Antioch and ends with customers utilizing CZ multiwall bags as far away as Denver.

The vessel has nine holds with a total capacity of nearly 800,000 cu. ft.—about the same as 200 railroad boxcars. Length of the tanker is 587 ft., beam 84 ft. Unloading at Antioch was expected to require three days following experiments in dilution and stripping methods.

FIRST pulp from Elk Falls is pumped from the hold of the "S. S. Duncan Bay" to processing at the new CZ mill in Antioch, Cal.

PULP from the tanker sluices along a trough toward rotary screens where most of the pumping water is taken out.

FLOW IS either directly to the high-density tanks or to this spreader that throws the pulp into a 1000-ft. outside storage bin.

"Noodle" pulp is loaded on the tanker via a mile-long overhead conveyor at Elk Falls and is unloaded via sluices at Antioch.

The 14,500-ton pulp tanker—the first ever commissioned—is owned by Universe Tankships Inc. and was built in Japan.

According to a spokesman for CZ, "She transports noodle pulp as handily as an oil tanker transports oil. This is the most economical method ever devised for the mass movement of our raw material."

Biggest in the West

Kraft paper from the Antioch machine (largest in the West with a daily capacity of more than 400 tons) will be converted at auxiliary plants into multiwall bags, corrugated containers and grocery and specialty bags.

Paper for tissue, towels and napkins, however, will come from three "little" machines to be installed at the new Antioch converting plant. Two of them (each with 20-ton daily capacity) will turn out tissue, while one will make toweling at a daily rate of 50 tons.

The "little" machines are similar to an experimental unit that Crown Zellerbach installed in 1955 at Los Angeles for the production of consumer products for the southern California market.

New kraft pulping facilities, designed for a 400-ton daily production, went into operation this past fall at Elk Falls. By early summer an additional 100 tons of kraft pulp and 140 tons of groundwood pulp, a bleaching plant and a paper machine for bleached kraft papers or newsprint will be in production.

Hudson Pulp & Paper Shelves Southern Plans

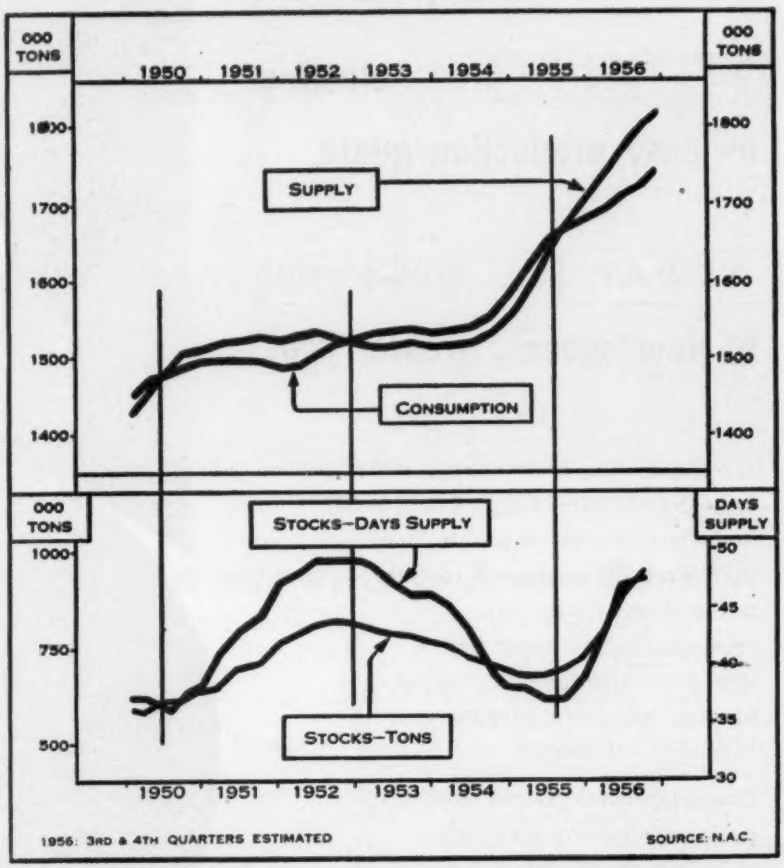
Hudson Pulp & Paper Corp. of New York, N. Y., has temporarily shelved plans for a proposed Florida newsprint mill "until technological problems can be worked out."

In a letter to southern newspaper publishers, William Mazer, president of Hudson, said in part:

". . . This does not mean that we are any less determined to get into the newsprint field. However, we feel it only fair to the publishers to let them know that we have not been able to get sufficient technological information to clearly indicate that a newsprint mill at Palatka would produce quality paper.

"We are continuing our research. When we have the proper answers to all of the technological problems, you will be hearing from us again. . ."

U. S. Supply, Consumption and Consumers' Stocks
(Seasonally adjusted, by quarters)



Newsprint Production at New Record Levels, NAC Reports

WORLD NEWSPRINT production in 1956 will again reach a new record level, according to the Newsprint Association of Canada. In its booklet, "Newsprint Data: 1956," the association reports that production for the free world countries would total almost 12,500,000 tons last year, up 8.1 per cent over 1955.

Rapid advance both in North America and abroad characterized developments during 1956. Canadian and United States production was expected to reach nearly 8,250,000 tons, up more than 500,000 tons over 1955. The Canadian mills, with an estimated total production of 6,500,000 tons, accounted for 310,000 tons of the increase, the largest output gain since 1947, when the mills were recovering from wartime curtailments.

U. S. consumption of newsprint was expected to rise to a new peak of 6,900,000 tons, gaining more than 250,000 tons over 1955—the previous high. "During 1956," the report states, "the rising trend of U. S. consumption has been fully sustained by new supply, and supplies have been available to permit a needed rebuilding of stocks from the abnormally low 1955 levels."

Free World Production Up

Shipments to Canadian consumers were estimated at 490,000 tons for 1956, up 60,000 tons from the previous year. The Canadian newsprint market now ranks fifth in the world.

Newsprint production in the free world countries other than Canada and the United States was expected to reach 4,200,000 tons in 1956, a rise of more than 400,000 tons in the year, while consumption was expected to be nearly 5,000,000. The difference between production and supply is comprised of imports, most of which came from Canada.

Looking ahead to 1957, the report

YESTERDAY . . . meeting
an easy production quota

TODAY . . . trail-blazing
to new speeds, greater profits

A few years ago, it was no problem to get and to hold your share of the market. Today, in the new competitive picture, leading mills across the country are turning to Puseyjones for the new developments that mean higher speeds and larger profits . . . to put them out ahead of competition, in quality *and* quantity.

Puseyjones developments have given a competitive advantage to mills with Puseyjones Machines. Today that advantage is more important than ever before. And tomorrow it will still mean capacity production, top quality, and higher profits.

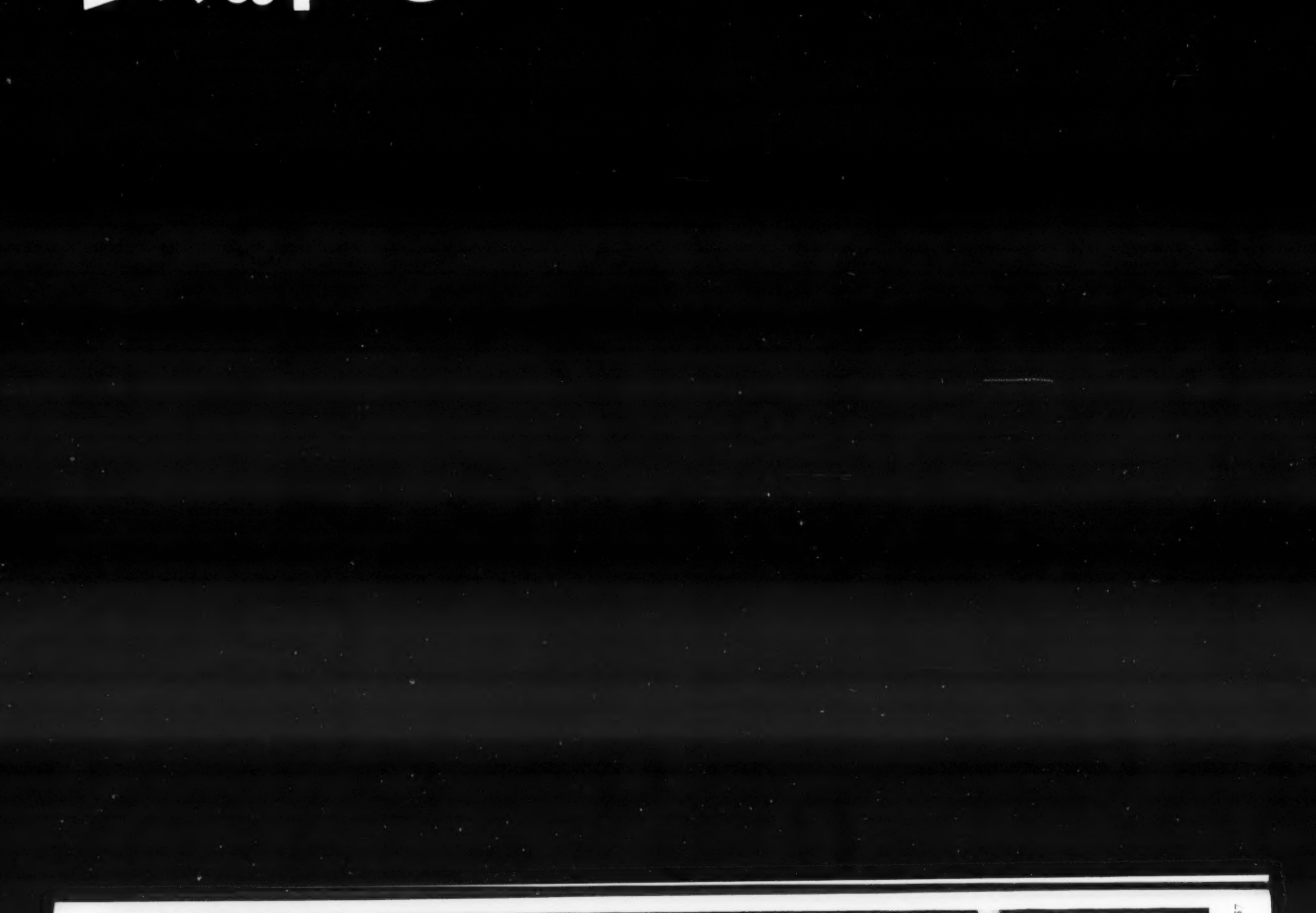
When you need a new machine . . . or to modernize an old one . . . it pays to talk it over first with the Puseyjones Engineers. Write or call them today.

THE PUSEY AND JONES CORPORATION
Established 1848 : : Builders of Paper-Making Machinery

Fabricators and Welders of all classes of Steel and Alloy Products

Wilmington 99, Delaware, U.S.A.

THE SIGN OF TRADE MARK SUPERIOR QUALITY



foresees a continuation of the current rising world trends. Regarding U. S. newsprint requirements, the booklet states that, "economic prospects are generally deemed to be favorable. Advertising outlays can be expected to expand, and newspapers will share in this and continue their leading position in the mass media field."

For the year 1957 as a whole, U. S. consumption is projected at 7,150,000 tons, up 250,000 tons from the 1956 estimate.

New Capacity Projects: U. S.

The following is a list of new mill projects, new machine installations and major improvement programs for the expansion of newsprint production facilities in the United States. The NAC warns that the list is not necessarily complete.

Bowaters Southern Paper Corp., Calhoun, Tenn. Is adding a third newsprint machine to increase annual capacity by 100,000 tons. A fourth unit may be installed if demand warrants.

Coosa River Newsprint Co. Is installing a third machine and making improvements to the two other units. Capacity is expected to increase by 135,000 tons by 1958.

International Paper Co. Is completing a 115,000-ton mill at Mobile, Ala., and a 130,000-ton plant near Pine Bluff, Ark.

St. Croix Paper Co. Is installing a 200-ton unit scheduled for production at the beginning of next year. Net annual capacity increase is expected to be about 45,000 tons.

Southland Paper Mills Inc. Is in the process of installing No. 3 machine, which will have an annual capacity of 75,000 tons. A fourth unit has been ordered for delivery in 1959.

Canadian firms expanding production, according to the NAC, include: Abitibi Power & Paper Co. Ltd., Anglo-Newfoundland Development Co., Bowaters Newfoundland Pulp & Paper Mills Ltd., Consolidated Paper Corp., Elk Falls Co. Ltd., Great Lakes Paper Co. Ltd., MacMillan & Bloedel Ltd., Mersey Paper Co., Ontario-Minnesota Paper Co. Ltd., Powell River Co. Ltd., Richmond Pulp & Paper Co., St. Lawrence Corp., Spruce Falls Power & Paper Co. Ltd.

Twenty-two foreign countries, in addition to the United States and Canada, have expansion plans underway.

PYRRHOTITE plant at the Burgess sulfite pulp mill of Brown Co. in Berlin, N. H.

Copper Waste Vital to Brown Co. Mill

WASTE MATERIAL from a copper mine in South Strafford, Vt., has become vital to the operation of Brown Co.'s sulfite pulp mill in Berlin, N. H. Leftovers from the waste are in turn making money for the pulp and papermaker.

The copper mine discard is pyrrhotite (an iron sulfide), which when burned produces sulfur dioxide gas. A shortage of natural sulfur several years ago forced Brown technicians to seek a "synthetic" source. Copper tailings, it was found, were ideal for producing the needed gas by the Dorr Fluo-Solids process.

When Brown burns the pyrrhotite for the gas by-product, magnetic iron oxide results, a waste that the pulp and paper firm sells to cement manufacturers. Further by-product markets are currently being explored.

First in the U. S.

The Brown Co. plant was the first installation of its kind in the United States and produces a gas strength of 12-13 per cent sulfur dioxide. In charge of the operation is Charles McKelvey, sulfite superintendent.

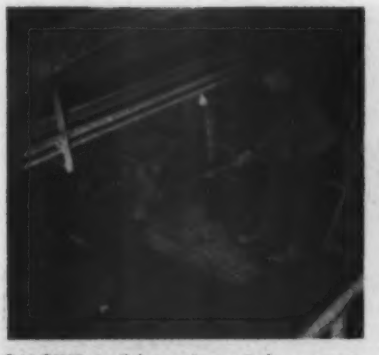
Pyrrhotite is received at the pulp mill in open gondolla cars and unloaded for either processing or storage. A traveling crane with a clamshell bucket dumps the ore into two wooden storage tanks with a total capacity of about 1000 tons.

The pyrrhotite plant produces more than half the sulfur dioxide used to make cooking acid for the sulfite mill.

The ore (with the appearance of partially-dried gray mud) is diluted with water. It is pumped into the reactor—a cylinder 16 ft. in diam-

ORE FROM gondolla cars is transferred via clamshell crane to storage tanks.

VALVE ON the giant reactor is adjusted. Unit is maintained at 1650°F.



CALCINE is "changed over" from car to pit by Wilfred Jacques, operator.

CHARTS are checked in the push-button control room by Raoul Larochelle.

eter and 17 ft. high—and onto a bed of burning ore and calcine. This bed is maintained at a constant temperature of 1650°F.

Gas burning in the reactor gives off sulfur dioxide gas, which is blown into the gas absorption towers in the sulfite acid plant. Water and soda ash are used to absorb the gas. The result: raw sulfite acid.

Brown's FluoSolids unit is capable of converting approximately 93 per cent of the sulfur in pyrrhotite into sulfur dioxide.

The by-product resulting is calcine, which is discharged from the reactor. Made up largely of iron but containing some zinc and other materials, it is sold to other manufacturers—principally cement makers—for process use.

In its first year of operation the plant processed 27,000 tons of pyrrhotite and yielded more than 18,000 tons of sulfur dioxide—the equivalent of 9000 tons of sulfur. This is an average of about 85 tons of pyrrhotite ore handled daily. The reactor is capable of still greater capacity.

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BUILT TO OPERATE AT ANY MACHINE SPEED

SYSTEMS ALSO BUILT FOR APPLYING SIZING MATERIALS, STARCHES, WAX EMULSIONS, PLASTICISERS AND OTHER SURFACE FINISHING SOLUTIONS

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Luke Warns Against Mistakes of Past

The "considerable danger" of repeating the over-expansion mistakes of the past was the warning voiced recently by David L. Luke Jr., president of West Virginia Pulp & Paper Co. He spoke at a New York, N. Y. meeting of the Salesmen's Association of the Paper Industry.

Luke asserted that if all announced increases in wood pulp capacity materialize, "the increase between the beginning of 1956 and 1960 will be 31.7 per cent in the United States; 33.4 per cent in Canada, and 32.2 per cent in North America as a whole." He added that the increase in paper grades of sulfite pulp capacity in "this short period would amount to 45 per cent."

Likely to accompany the growth of pulp supplies are capacity increases for paper and board mills, Luke continued, recalling the pulpwood expansion between the two world wars (30 to 40 per cent), which resulted in "destructive price competition and inadequate earnings or actual losses for most producers."

Luke's only concern is with the timing of the proposed expansion. He has "no doubt whatever" that eventually all the 1956-60 capacity will be fully utilized by the paper industry. He called for "creative selling efforts to continue to educate the business community and the consuming public in new and expanded uses for paper" and declared that the paper industry must compete for markets previously dominated by wood, metal and textiles.

An Era of Progress: McCabe

"An era of progress beyond our fondest dreams" was the forecast of Thomas B. McCabe, president of Scott Paper Co., as he spoke recently at Mobile, Ala. The occasion was the dedication of Scott's new multimillion dollar tissue mill that will house two high-speed machines. Other facilities under construction include converting and shipping structures.

"We in industry," McCabe said, "have a very real stake in fulfilling a challenging estimate that the nation may approach the $600 billiom mark in total output of goods and services in the next 10 years.

"If it is to be met, we will surely have to continue to build new plants, expand existing ones and provide more jobs. We will have to continue to improve the qualities and values of the brands we manufacture and provide Mrs. American Consumer with more and more of the type of products she needs or wants for modern living. And, if we are to meet these goals, we will have to develop sound long-range plans that in turn help attract new capital for further expansion."

Mead Corp. Acquires Atlanta Paper and Jackson Box Co.

Affiliation of Atlanta Paper Co. of Atlanta, Ga., with Mead Corp. was announced recently in Dayton, Ohio, by the Mead board of directors. Several days prior to the announcement, it was reported that Mead had acquired 51.3 per cent of the common stock of Jackson Box Co. of Cincinnati.

Both firms are to be operated as wholly owned subsidiaries.

Atlanta Paper, the world's largest manufacturer of carry-home cartons for the soft drink industry, will strengthen Mead's position in the paperboard field. Kraft linerboard is to be furnished by Mead mills at Macon (Georgia Kraft Co.) and Rome (Rome Kraft Co.).

Atlanta Paper has four principal packaging divisions: Bottle Master; Folding Carton; Cluster-Pak, and Corrugated. In addition, it maintains a large machinery division for the manufacture of Cluster-Pak packaging ma-

chines. The firm operates three plants in Atlanta with approximately 500,000 sq. ft. of manufacturing area plus two subsidiary organizations: Packagemaster Ltd. of Toronto and Palm Container Corp. of Miami.

Jackson Box has plants in Cincinnati and in Durham, N. C., in addition to substantial interest in three other box firms: York Container Co. of York, Pa.; Evert Container Corp. of Milwaukee, and Delavans Inc. of Syracuse, N. Y.

New Scott Mill in Alabama Nears Start-Up

Scheduled start-up time for the new Scott Paper Co. mill at Mobile, Ala., is this summer, at which time the first of two new high-speed tissue machines will go into operation. The multimillion dollar plant is located adjacent to the Hollingsworth & Whitney Div. specialty paper mill.

Other facilities currently under construction include converting and shipping structures.

The mill will produce the first Scott trademarked brands ever manufactured in the South.

The current Scott building program will provide for additional pulp equipment, including new digester capacity; recovery boiler equipment, and wood preparation and water treatment facilities. The new equipment will make possible the production of a minimum of 120 additional tons of bleached sulfate pulp per day. This will raise the mill's total daily capacity to 540 tons of sulfate pulp, of which 375 will be bleached.

It is anticipated that the two new machines will produce an average of 140 tons of paper daily. This tonnage will be converted into Scott's three brands of bathroom tissues, as well as household paper towels.

AT CEREMONIES in Mobile, Ala., Thomas B. McCabe, president of Scott Paper Co., places a Scott product in the cornerstone of the multimillion dollar mill now nearing completion. With him is John W. McNichol, executive assistant to the vice president.

PRODUCTION of frozen meat wrappers at Nekoosa-Edwards Paper Co. in Port Edwards, Wis., has been increased with the modernization of waxing equipment. The work was done by the Dilts Div. of the Black-Clawson Co. Among the improvements that made possible a machine speed-up from 800 to 1100 fpm was the installation of a Dilts running belt tension type unwind to replace a friction type unit.

Mill Record Set by Mersey Paper

Mersey Paper Co. Ltd. at Liverpool, N. S., established a new mill record recently when 500 tons of newsprint were produced in one day. The original daily capacity of the plant was 250 tons. (The firm, established in 1929, earlier this year became a unit of Bowater Corp. of North America Ltd.)

Estimated output for 1956 at Mersey is 140,000 tons, most of which has been sold on long-term contracts to newspapers in northeastern United States.

Simpson Paper to Boost Capacity 33% in 1957

Simpson Paper Co. of Everett, Wash., will increase its capacity by more than a third during 1957. The expenditure of $3,000,000 for modernization and expansion was recently approved by the parent firm, Simpson Timber Co.

A 40-ton increase in daily capacity will be made possible through the rebuilding of the firm's 150-in. fourdrinier to permit operating speeds in excess of 1000 fpm, in addition to modifications on two smaller units and an enlargement of related equipment.

Also planned is the considerable enlargement of existing facilities. Increased pulp production will be obtained through changes in the old-paper department and deinking plant. additional bleach plant washers and

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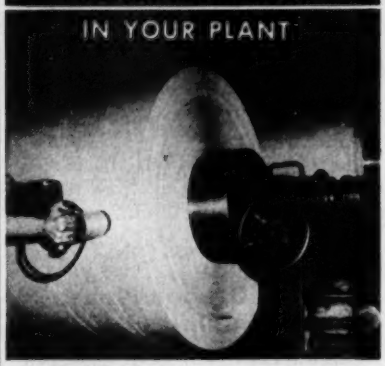

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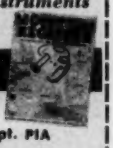

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provision for added high-density storage. Power distribution installations are to be revamped to handle heavier demands.

While major rebuilding and actual construction was to begin early this year, some modification is already underway in anticipation of the increased production. Preparatory work was expected to cost about $1,000,000.

Recently erected was a barker plant housing a 50-in. "Roto" mechanical barker and the latest in log- and wood-handling equipment. Engineering and laboratory facilities are being modernized and enlarged.

It is expected that by the end of 1957 capacity of the mill will be 150 tons daily. Present capacity is slightly more than 100 tons.

CZ Drops Oregon Plans; Considers California

Crown Zellerbach Corp. has abandoned its study for a proposed 400-ton kraft pulp and paper mill in the Astoria, Ore. area. Among reasons given for the action were the large number of expansions by other mills in the Northwest and the high cost of financing.

At the same time, Crown Zellerbach has taken an option on 187 acres of land near Ventura, Cal.

A spokesman for the firm explained that the site is one of several being considered for a proposed paper mill in southern California, and that it would be several years before such a plant could be developed.

FTC Suit Against International Dropped

The United States Court of Appeals for the Second Circuit (New York, N. Y.) has dismissed a petition by the Federal Trade Commission for an injunction against International Paper Co.

The FTC had sought to restrain International from further integrating, consolidating or disposing of any of the assets of the former Long-Bell Lumber Companies pending completion of hearings on the Commission's complaint challenging their recent merger into International.

The petition was dismissed by the court after the FTC's argument had been concluded and during the course of the argument by International's counsel.

Herty Foundation Expansion Confirmed

A new laboratory is planned to house the expanded facilities of the Herty Foundation in Savannah, Ga. This was confirmed recently by William L. Belvin, director of the foundation.

Based on 1951 figures, research at the laboratory has increased by 600 per cent, while the staff has grown by 400 per cent.

The added building facilities will contain about 20,000 sq. ft. of floor space. The one-story structure will boast modern pilot plants for the evaluation of various pulp and paper products. There will also be expanded library, conference and office facilities.

Among the pilot plant equipment will be the small-scale paper machine 31 in. wide, eight-refining processes, pulp cooking and pulp preparation facilities, screening and chipping devices and space for the future installation of continuous pulping equipment.

Powell River to Build Mill in Central Oregon

Brooks-Scanlon Inc. of Bend, Ore., has been purchased by Powell River Co. Ltd. As a result, the British Columbia firm will construct a pulp mill in central Oregon. Brooks-Scanlon operates lumber mills in the area.

Included in the assets of Brooks-Scanlon are 147,000 acres of timberlands in the Deschutes Plateau region that will be harvested on sustained yield.

Under terms of the agreement (yet to be approved by the respective boards of directors), a pulp mill will be built by Powell River, while the sawmill at Bend will be modernized and barking and chipping facilities installed.

Recent Expansions in the Industry

Bay West Paper Co.

of Green Bay, Wis., will construct a $267,658 plant addition. The structure will be of one-story design and 35,048 sq. ft. in area.

Gardner Board & Carton Co.

of Middletown, Ohio, has purchased Brooks Co. Inc. of Springfield, Mass. The New England firm manufactures cartons and display containers and specializes in color lithography for

SPECTACULAR DUMPING action of Powell River Co. Ltd.'s newest self-tilting log barge at the log storage and breakdown grounds at Teakerne Arm, B. C. Tilt begins (l) as the four 8-in. valves are opened to flood portside tanks. At the height of the tilt (r) 1,500,000 ft. of logs churn the water as they slide from the deck. A self-bailing mechanism then empties the tanks, and the 342.8-ft. vessel returns to equilibrium. Powell No. 2 was launched in the spring of 1955 following the successful operation of her sister ship.

the first
hydraulically-regulated differential gear drive

After years of intensive research, development and testing, Black-Clawson has developed a superior paper machine drive that provides:

Precise synchronous speed regulation

Accurate draw adjustment

These important operating characteristics are obtained through a unique hydraulic-motor differential-cage drive and a hydraulic tachometer-motor feedback-control arrangement.

Other significant operating features of the new Black-Clawson drive are:

Machine sections can be inched *or reversed* with line shaft running or *dead*.

No helper motors or inching motors required—no belts or chain drives are used.

Durability, ease of control and flexibility never before available are built into this compact differential gear drive unit.

Write for descriptive bulletin 10-PMB which gives the full story on design and operating characteristics.

The Black-Clawson Company

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In Canada: Black-Clawson (Canada) Ltd., Montreal, P. Q.

...for superior paper

Use OK BRAND Starches

at no extra cost

the complete paper mill line

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KEOJEL	OK			
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PEARL	OK			
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There's an OK Brand product especially formulated for every paper mill operation requiring starches and adhesives ...and there's no extra cost for these top-quality OK BRAND products.

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labels, gift wraps, package inserts, greeting cards and advertising material.

Nekoosa-Edwards Paper Co.
shareholders at a special meeting in Port Edwards, Wis., have approved a plan to borrow $10,000,000 for financing plant expansion. A major item is to be the installation of a new fine paper machine at Nekoosa.

Hopper Paper Co.
of Taylorville, Ill., has purchased the physical assets of Modena Paper Co. of Modena, Pa. The two-machine unit will complement existing Hopper plants at Reading, Pa., and Taylorville. Considerable conversion and modernization is planned to eventually add approximately 15,000 annual tons to the production of offset papers and specialties.

Dexter Sulphite Pulp & Paper Co.
of Dexter, N. Y., whose mill has been idle for some time, has been purchased by Abe Cooper, president of Taggart Paper Mills Inc. of Watertown. Included in addition to the five-story mill building were a warehouse, steam plant, press department and 17 tenant houses.

Pakistan Industrial Development Corp.
has started construction of its $20,000,000 newsprint mill near the town of Khulna, East Pakistan. The plant, which will have an annual capacity of 23,000 tons of newsprint and 12,000 tons of mechanical printing paper, will utilize Gewa wood. Two paper machines and related equipment valued at $3,000,000 will be supplied by Wartsila Koncern A/B of Helsinki, Finland, while electrical equipment will be furnished by Siemens-Schuckertwerke Aktiengesellschaft of Erlangen, West Germany. Consulting firm for the project is Sandwell & Co. of Vancouver, B. C. Construction is a joint venture of Balfour, Beatty & Co. (Canada) Ltd. of Toronto and Provincial Engineering Ltd. of Niagara Falls, Ont.

Allied News Notes . . .

Gottesman & Co. Inc. has announced the opening of a branch office in London to serve wood pulp sales in the United Kingdom. The branch is to be known as Central National-Gottesman Ltd. It will enable Central National Corp. of New York, N. Y., a member of the Gottesman organization, to handle sales of all grades of wood pulp through London on a direct basis.

Stockholders of **Hooker Electrochemical Co.** and **Oldbury Electrochemical Co.** have approved consolidation of Oldbury into Hooker. For the present, Oldbury is to be operated as a Hooker division.

DeZurik Shower Co. of Sartell, Minn., has announced a change in the corporate name to DeZurik Corp. At the same time, the company reported completion of its most recent expansion project.

In future transactions, products of the Penn Instruments Div. of **Burgess-Manning Co.** are to be known as Burgess-Manning instruments instead of Penn instruments as at present.

Link-Belt Co. has announced plans to build a plant at Montebello, Cal., and to replace and expand present facilities in Los Angeles. The Montebello plant will house the factory branch store and district sales offices.

All beater fillings formerly manufactured and supplied by the Dilts Div. of **Black-Clawson Co.** are now being handled by the Shartle Div.

Coming Events

Tappi

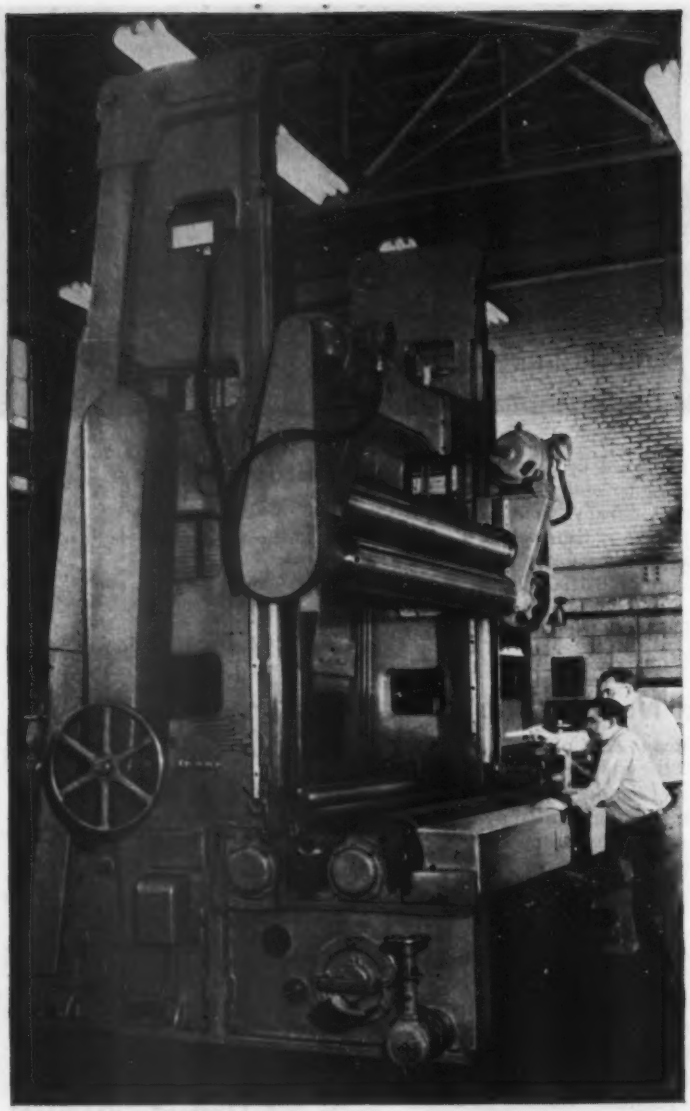
Jan. 18-19—Southeastern Section, Jacksonville, Fla.
Feb. 18-21—Forty-second Annual Meeting, Hotel Commodore, New York, N. Y.
March 12—Lake States Section, Appleton, Wis.
March 22-23—Southeastern Section, Charleston, S. C.
April 5—Pacific Section, Everett, Wash.
April 9—Lake States Section, Milwaukee
May 20-23—Eighth Coating Conference, Pfister Hotel, Milwaukee
May 24-25—Southeastern Section, Savannah, Ga.

Superintendents Association

Jan. 22—Miami Valley Div., Manchester Hotel, Middletown, Ohio
Jan. 24—Michigan Div. (joint meeting with Kalamazoo Valley Tappi), Hotel Harris, Kalamazoo
Feb. 14—Michigan Div., Hotel Harris, Kalamazoo
March 26—Miami Valley Div., Manchester Hotel, Middletown, Ohio
April 4-5—Michigan Div. (joint meeting with Kalamazoo Valley Tappi), Dow Chemical Co., Midland, Mich.
April 27—Michigan Div., Hotel Harris, Kalamazoo
April 30—Miami Valley Div., Manchester Hotel, Middletown, Ohio

Other meetings

Jan. 23-25—CPPA Technical Section, annual meeting, Sheraton-Mount Royal Hotel, Montreal
Jan. 23-25—Twelfth Annual Symposium on Instrumentation for the Process Industries, Texas A&M College, College Station, Texas
Jan. 23-25—Eighth Annual Southeastern Symposium on Industrial Instrumentation, University of Florida, Gainesville
Jan. 28-31—Plant Maintenance and Engineering Show, Public Auditorium, Cleveland
Feb. 7-8—American Management Association, Conference on Nucleonics in Industry, Hotel Statler, Boston
Feb. 18-22—American Paper & Pulp Association, annual meeting, Waldorf-Astoria, New York, N. Y.



Standard design **Langston Slitters & Winders** adapt easily for special application

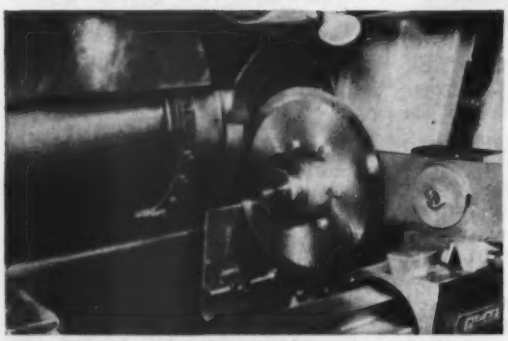
Here's a Langston Slitter & Winder recently installed at the St. Regis Paper Co. mill at Pensacola, Fla., to wind extremely heavy board. The maximum trim is only 92 in., but the weight of the board and the diameter of the rewound roll demanded a machine of unusual stamina.

The machine indicated was the Langston Model DH with certain special features: 18-in. diameter drums and idlers that guard against checking of the heavy board, hydraulic roll ejector, automatically controlled air brakes on main drums and idler rolls.

Density of the roll can be held constant all the way from the beginning of the wind, largely as a result of a newly designed hydraulic control of the pressure roll. Starting at a preset value, rider roll pressure is gradually reduced as the rewound roll builds up in diameter, thus automatically compensating for its increased weight.

Roll density is further controlled by independent, variable-speed motors at each end of the rider roll. D-c ammeters and tachometers indicate rider roll tensioning effort.

Langston Slitters & Winders are available in sizes to 196 in. wide and 72 in. dia. Speeds to 4000 fpm and beyond. Write SAMUEL M. LANGSTON CO., Camden 4, N.J.



Shear-cut slitter. Rear slitter is power driven and rotates front slitter by friction. Paper passes between and is actually sheared by the action of the two knives. This means cleaner edges, cleaner paper rolls, cleaner plant.

Setting the slitters. Operator has free access to power-driven slitter knives from either rear or front of machine. Here he measures trim slitter for position. Notice also the 18-in. idler roll beneath his hand and the ejector roll hydraulic mechanism over his left shoulder.

LANGSTON *Leadership — by design*

SHEAR CUT | CLEAN CUT

NAMES *in the* NEWS

NEWLY APPOINTED officers of P. H. Glatfelter Co. at Spring Grove, Pa., are (l to r) J. Russell Hoke, formerly secretary and assistant treasurer, vice president and treasurer; A. J. Luettgen, formerly mill manager, vice president and general manager, and John L. Myers, formerly assistant secretary, secretary and assistant treasurer.

Becker Resigns as Rhinelander Gen. Manager

Folke Becker has resigned as general manager of Rhinelander (Wis.) Paper Co., a subsidiary of St. Regis Paper Co. He will continue as board chairman and is succeeded as general manager by Benton R. Cancell, president of the firm since 1954.

Becker came to Rhinelander in 1926 as general superintendent. He became general manager in 1928; president in 1935, and board chairman in 1954. He is also president and a director of R-W Paper Co. of Longview, Wash., and a director of St. Regis. Becker on January 1 became a consultant to the entire St. Regis organization.

Continental Can Names Dyke; Gair Div. Appoints

George E. Dyke, formerly board chairman and president of Robert Gair Co. Inc., has been elected vice chairman of the board of Continental Can Co. (Gair merged with Continental in October.)

The activities of the Robert Gair Div., together with the paperboard and fiber drum operations of Continental Can, will be administered under the general supervision of Dyke as vice chairman of the board.

Continental Can has also elected three new vice presidents: Raymond F. DeVoe and Norman F. Greenway, former senior vice presidents of Gair, and Robert L. Fitts, a Gair vice president.

It was announced recently by Continental Can that Carl E. Eggerss, vice president of the Fibre Drum Div., retired December 31 following more than 45 years in various phases of the paper container field. He has been succeeded by Peter P. Wojtul, Continental's vice president in charge of sales.

George E. Dyke

C. E. Eggerss

Other recent appointments in the Robert Gair Div. of Continental Can are as follows:

George E. Prokupek, former assistant superintendent of the Tonawanda, N. Y. boxboard mill, has been named assistant to the vice president for boxboard operations. Succeeding Prokupek at Tonawanda is Everett Raymond, who joined the firm in 1935.

Frank R. Soos, formerly superintendent of Egg-Safety operations, has been appointed assistant plant superintendent at the Elkhart, Ind. folding carton plant.

Arthur J. Beilein, personnel manager since 1952, was recently named superintendent of finishing operations at Tonawanda. Succeeding him in the personnel post is James O. Elmore, formerly associated with Fedders Quigan Corp. in industrial relations.

Olin Mathieson Appoints

Three appointments in the research and development department have been announced by the Forest Products Div. of Olin Mathieson Chemical Corp.

Paul L. Gilmont, formerly head of the research division in the pulp and paper section of Crossett Co., becomes supervisor of pulp and paper research. At one time he was a research chemist for Rayonier Inc. at Shelton, Wash.

Russell F. Jagoditsh, formerly chief chemist with Chase Bag Co., was named group leader for coating. Jogoditsh was at one time associated with the Bagpak Div. of International Paper Co. in Camden, Ark.

Craig C. Campbell, production manager of Wynnewood Products Co. at Jacksonville, Tenn., was made group leader for waste utilization.

William J. Verross, pulp mill staff engineer, has been promoted to assistant pulp mill superintendent at the Covington, Va. plant of West Virginia Pulp & Paper Co. **Wendell B. Hammond,** pulp mill technical assistant, was advanced to the post of supervisor of digesters and semi-chemical units.

Karl Clauson, president of Stora Kopparberg Corp., was recently elected president of the Association of American Wood Pulp Importers.

Howard C. Bedson has been appointed manager of Diamond Match Co.'s molded pulp plant at Palmer,

Mass. Bedson, who was formerly plant superintendent, succeeds **John C. Benny.** Benny has been transferred to the firm's new integrated forest products plant at Red Bluff, Cal.

Albert H. Lockwood has resigned as president and treasurer of Consolidated Paper Co. in Monroe, Mich. **C. Q. Baron,** executive vice president and general manager, becomes president and general manager. **S. J. Newcomer** adds the duties of treasurer to his former positions of vice president and general sales manager.

Robert B. Maucker, administrative assistant to the first vice president and general manager, has been named to the new position of mill manager for Alton Box Board Co. of Alton, Ill. At the same time it was announced that **Harry S. Adler,** who retired recently as secretary of the National Paperboard Association, has been appointed assistant to Marvin W. Swaim, first vice president and general manager.

William B. Groff, in charge of solid fiber sales in California, has been made plant manager of the Malt Ave. plant of the California Container Corp. Div. of Container Corp. of America in Los Angeles.

Emerson Lewis, pulp mill superintendent, has been named superintendent of wood utilization at Eastern Corp.'s new kraft pulp mill at Lincoln, Maine. He joined the firm in 1948.

Emerson Lewis

J. W. Cox

John W. Cox has been elected executive vice president of Federal Paper Board Co. Inc. He was formerly a vice president of Diamond Match Co. and at one time was president of General Package Corp.

Gardner Board & Carton Co. has promoted **William H. Aiken** to the position of director of research and development. He was formerly technical director. At the same time it was announced that **Glenn Battaglia,**

Names in the News . . .

a chemical engineer, has been appointed technical supervisor of the Lockland, Ohio board mill; **Charles Price,** also a chemical engineer, as technical supervisor for Yoder Engraving Co., a wholly owned subsidiary of Gardner, and **Richard Boggs** as technical supervisor of the Lockland carton plant.

Peter M. Belyea, who has been with the firm's lumber and logging department since 1949, has been named divisional forester for the Edmundston Pulpwood Div. of Fraser Companies Ltd.

P. M. Belyea

J. G. Albert

John G. Albert, general traffic manager for West Virginia Pulp & Paper Co., has been named chairman of the traffic committee of the National Paperboard Association.

D. M. Martin, formerly chief chemist, has been named production manager for the Folding Carton Div. of Cornell Paperboard Products Co. in Milwaukee.

William Rindsland has been appointed to the central engineering staff of Minnesota & Ontario Paper Co. A former Mando employee, he has also been associated with Wood Conversion Co. and Rayonier Inc.

Dr. Robert F. Husband, a faculty member at the State University College of Forestry at Syracuse (N.Y.) University, has been promoted from research associate to associate professor of pulp and paper technology. He has been doing research work in hardwood pulping.

David J. Benjamin has been named general manager of the Western Waxide Specialty Packaging Div. of Crown Zellerbach Corp. to succeed the late J. E. Crosby. He was formerly president of Waxide Paper Co. in Kansas City.

R. M. Bishop

W. E. Haviland

R. M. Bishop, former development engineer with Anglo-Canadian Pulp & Paper Mills Ltd., has been named assistant to the mill manager of Dryden Paper Co. Ltd. in Dryden, Ont. **W. E. Haviland,** control superintendent at Dryden, has been promoted to assistant to the general superintendent.

James Rogers, formerly vice president of J. & J. Rogers Co. of Au Sable Forks, N.Y., has joined Brown Co. of Berlin, N.H., as assistant to the president.

Gilbert C. Robinson, formerly director of the experimental pulp mill at Covington, Va., has been named pulp mill superintendent at the Williamsburg, Pa. mill of West Virginia Pulp & Paper Co. He joined West Virginia in 1951 at Mechanicville, N. Y.

G. C. Robinson

B. La Touche

Buford La Touche Jr. has been appointed plant superintendent of the Fibre Board Container Div. of Robert Gair Co. Inc. in Richmond, Va. He was formerly personnel manager and purchasing agent.

Allied Personalities . . .

Earl R. Pennington, formerly of West Virginia Pulp & Paper Co., and **John Forbes,** former Downingtown Mfg. Co. sales engineer, have joined the sales staff of the Shartle Div. of Black-Clawson Co. at Middletown, Ohio.

Robert J. Sutton, who will continue as secretary-treasurer, has been

named director of purchases at the Atkins Saw Div. of Borg-Warner Corp. of Indianapolis.

Lunkenheimer Co. has announced two additions and a transfer in the sales staff: **Vicent P. Mahon** as a sales representative in Chicago; **Edward J. Blake** as a representative in St. Louis, and **Robert Thomson,** who has been transferred from St. Louis to Charleston, W. Va.

Frank F. Elliott has been named chairman of the board of Crane Co. and has been succeeded as president by **Neele E. Stearns,** formerly vice president for planning and development of Inland Steel Co.

Four appointments were reported recently by the Penn Instruments Div. of Burgess-Manning Co.: **R. J. Medkeff,** formerly chief development engineer, as chief engineer; **William Melas,** chief engineer of the instrument department, as consulting engineer; **Adalbert Melas,** in charge of calibration work, as service manager, and **Clifford C. Harris,** chief accountant, as assistant secretary.

Emil Alter has been named head of the natural gums laboratory of Stein, Hall & Co. Inc. at Long Island City, N. Y. He was formerly a chemist with the firm.

Fred C. Foy, president of Koppers Co. Inc., has been elected to the board of directors of H. K. Porter Co. Inc.

Alfred J. Olson, sales manager, has been made general sales manager for the Chicago plant of Joseph T. Ryerson & Son Inc., steel distributor. In another Ryerson appointment, **Theodore L. Kishbaugh,** manager of the Los Angeles steel service plant, has been named assistant vice president in the procurement department.

John W. Little has succeeded **Joseph T. Hartson** as president of Goslin-Birmingham Mfg. Co. He was also made a member of the board. Hartson retired January 1.

O. F. Hutchinson, recently director of sales for Sveen Pedersen Sales Corp., has joined the technical service staff of Peter Cooper Corporations. He is a member of the Tappi Water Committee.

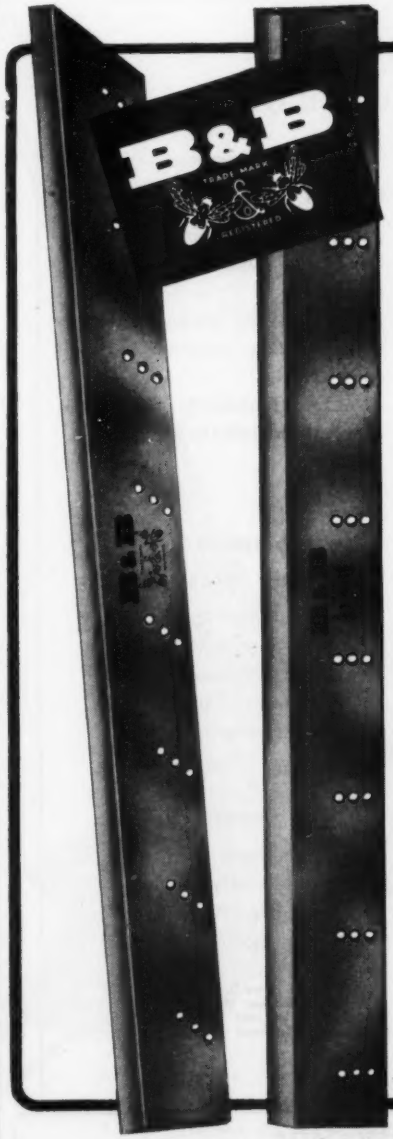
Five new officers have recently been appointed by Beloit Iron Works: **E. D. Beachler,** vice president for engineering; **A. W. Laage,** vice president in charge of industrial relations; **A. A. Neese,** vice president and secretary; **E. H. Neese Jr.,** treasurer and assistant to the president, and **D. R. Simonds,** vice president for sales. Succeeding Beachler as chief engineer, is **E. Sterling Skinner,** formerly assistant chief engineer.

Richard M. Erwin, a representative of the Eastern Tractor Equipment Div., has been made manager of Hyster Co.'s Washington, D. C. office and manager for the East Central Industrial Truck Div.

Ralph F. Brengelman, a special expediter in the purchasing department, has been appointed purchasing agent for the Lunkenheimer Co.

James E. Good, formerly with J. H. Williams Co., has been made field sales manager for the Atkins Saw Div. of Borg-Warner Corp.

Ray E. Frase, a special consultant



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and advisor on palletization, has been named manager of the special products department of Signode Steel Strapping Co.

Lyle C. Woods, manager for refined oil sales in the Philadelphia territory, has been appointed manager of the chemical department of A. E. Staley Mfg. Co.

Ken Jones, Seattle district manager, has been transferred to the New York, N. Y. office of J. O. Ross Engineering Corp.

R. B. Porter has been named chief chemist of the sales and research laboratory of Nopco Chemical Co.'s Paper Chemicals Div.

Ernest Schleusener, vice president for manufacturing of Mueller Brass Co., has been elected vice president, treasurer and a director of Rodney Hunt Machine Co.

Thomas P. Turchan, manager of manufacturing for the Agricultural Chemicals Div., has been named assistant general manager of American Cyanamid Co.'s Industrial Chemicals Div.

Carl Thumin, who has been associated with the firm since 1952, has been named vice president in charge of manufacturing for E. P. Lawson Co.

Necrology . . .

J. P. Weyerhaeuser Jr.

John Philip Weyerhaeuser Jr., president of Weyerhaeuser Timber Co. since 1947, died December 8 at the age of 57.

A native of Illinois, Weyerhaeuser began his career in the lumber industry in 1921 with Edward Rutledge Timber Co. of Cour d'Alene, Idaho. In 1925 he was named general manager of Clearwater Timber Co. and in 1931 became president of Potlatch Forests Inc. He joined Weyerhaeuser as executive vice president in 1933.

B. T. Larabee

Benjamin T. Larabee, 76, president of the American Pulp & Paper Mill Superintendents Association in 1929, died recently. He was superintendent of the S. D. Warren Co. pulp mill in Westbrook, Maine, until his retirement in 1946.

Larabee began his papermaking career with S. D. Warren in 1904 and later became superintendent of the Longview, Wash. sulfite plant of Weyerhaeuser Timber Co. In the 1930's he became associated with Brown Co. at Berlin, N. H., as superintendent of the Burgess sulfite mill, after which he rejoined the S. D. Warren staff.

William J. Livingston, 80, who had been with Dexter Sulfite Pulp & Paper Co. for many years prior to his retirement, died recently. He had been a member of the Superintendents Association since 1922 and a life member since 1949.

John F. Shea, vice president in charge of sales for the Becco Chemical Div. of Food Machinery & Chemical Corp., died November 26 after a long illness. He was 51.

Charles E. Ackley, 61, paper mill superintendent for Crown Zellerbach Corp. at West Linn, Ore., died in Green Bay, Wis., in November while on a business trip.

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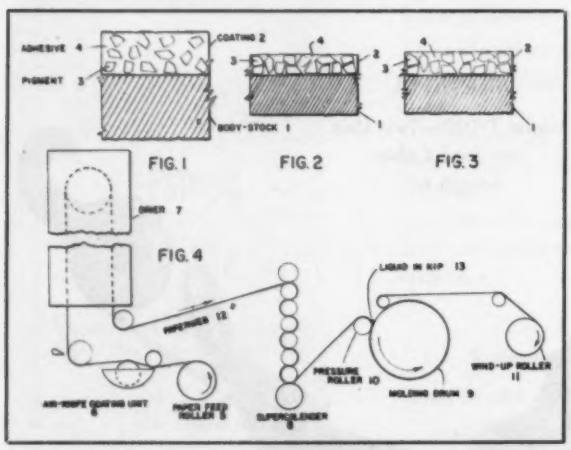
PATENT REVIEWS

MELVIN NORD*

Production of high gloss mineral-coated paper

U. S. 2,759,847, issued Aug. 21, 1956 to Frederick H. Frost and Philip S. Leighton, assigned to S. D. Warren Co., describes a process for producing mineral-coated paper coated on one or both sides and having a very high gloss and a very level surface.

The invention is based on the discovery that the application of aqueous liquid to the surface of a hard, dry, densified supercalendered coating consisting of hydrophilic material on a sheet of paper just as it passes into the nip between a highly polished roll and a backing roll with the coating facing the polished roll, will cause the hydrohilic material at the surface of the coating to swell, become moldable, and by expansion to be pressed against and molded by the polished roll, thus receiving a surface which is complementary to that of the polished roll.



In Fig. 1, 1 is the paper body stock and 2 the coating consisting of pigment particles 3 and adhesive 4. Fig. 2 shows the paper after supercalendering; here the body stock and the coating have both been compressed, and the surface has been made more nearly level. As shown in Fig. 3, after the paper has received the gloss treatment described above, the coating has been slightly swelled, and its surface has been further smoothed and leveled.

As shown in Fig. 4, 5 is a feed roller for the paper body stock, 6 is a conventional air knife coating unit, 7 a dryer, 8 a supercalender, 9 a molding drum having a highly polished chromium surface, 10 a pressure roller, 11 a windup roller, and 12 the paper web. A pool of wetting liquid in the nip between the molding drum and the paper web is shown at 13.

Papermaking machine

U.S. 2,764,068,, issued Sept. 25, 1956, to Tom Sutherst and assigned to Beloit Iron Works, discloses a method for the starting of the paper web in its run through the press section and dryer section of a machine using automatic vacuum transfer to transfer the web of paper from the wire into the press section.

In Fig. 5, a forming wire 1 is trained around a suction couch roll 2 and a return roll 3, the paper web 4 being taken from the wire between the couch roll and the return roll by a suction transfer roll 5 and an endless pickup felt 6 passing between the transfer roll and the forming wire. The endless felt 6 leads from the transfer roll 5 to a first press consisting of a suction roll 7 and a top press roll 8, the felt 6 returning to the transfer roll 5 around felt, guide and stretcher rolls 9. An endless bottom felt 10 serves both the first press and a second press consisting of a suction roll 11 and a top press roll 12, the felt extending beyond the second press to felt roll 13 and returning to the first press around felt and guide rolls 14, 14A, and stretch roll 15.

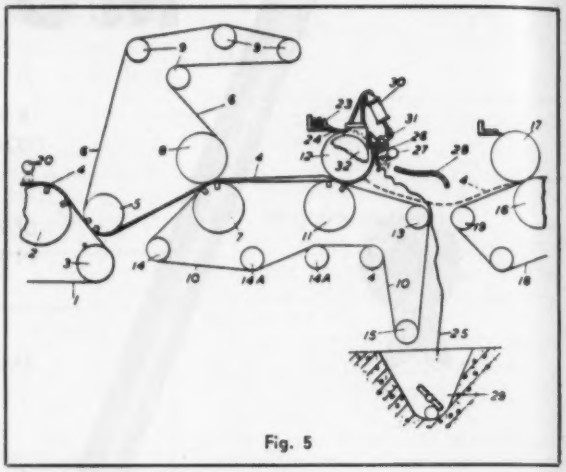


Fig. 5

The web 4 passes from the second press to a third press, consisting of bottom roll 16 and top press roll 17, served by an endless bottom felt 18 which approaches the third press after turning around felt roll 19, the web 4 bridging the space between the felt roll 13 and the felt roll 19. This space is wide enough for the mass of broke to pass.

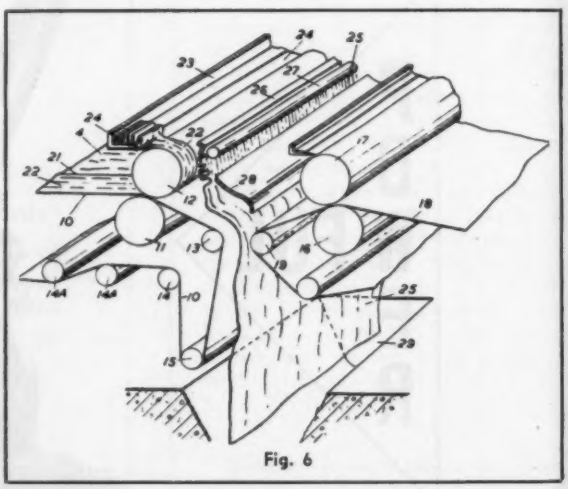


Fig. 6

In forming a tail for starting up, a water jet 20 cuts the web along line 21. As shown in Fig. 6, temporary collection of the tail 22 thus formed takes place in a tray 23 behind the normal full-width doctor 24 of the plain top roll of the second press. The broke 25 is removed from the top roll by a doctor 26 extending across a width less than the total width of the top roll 12 by the width of the tail. An air jet 27 directs the broke 25 between a guard 28 and the top roll 12 onto the bottom felt 10, to be carried over the felt roll 13, and fall for collection into a hog-pit 29.

The doctor 26 can quickly be brought into contact with the top roll 12 and as quickly drawn out of contact with the top roll by air cylinders 30 and levers 31.

Improving paper formation

U. S. 2,754,207, issued July 10, 1956 to Milton O. Schur and Robert M. Levy, assigned to Ecusta Paper Corp., describes a process for improving the sheet formation characteristic of paper containing a positively charged filler. The paper will generally be of

*Patent attorney, 17600 Pinehurst, Detroit 21.

a high quality, in which "formation" or appearance is one of the important characteristics. The process is especially significant in connection with lightweight water leaf types of paper.

The process consists of incorporating in the paper furnish, a chemical compound that reverses the sign of the electrical charge on the filler so that it becomes negatively charged and repels the negatively charged cellulosic fibers, thus lessening the tendency for agglomeration of the cellulosic fibers and filler particles. This results in improved sheet formation due to better distribution of the fiber and filler components.

The chemical compound added is a soluble polyphosphate, such as tetrasodium pyrophosphate.

Bleaching tower

U.S. 2,764,011, issued Sept. 25, 1956, to Johan C.F.C. Richter and assigned to Aktiebolaget Kamyr, describes a tower for bleaching pulp utilizing upward feed for high-density pulp.

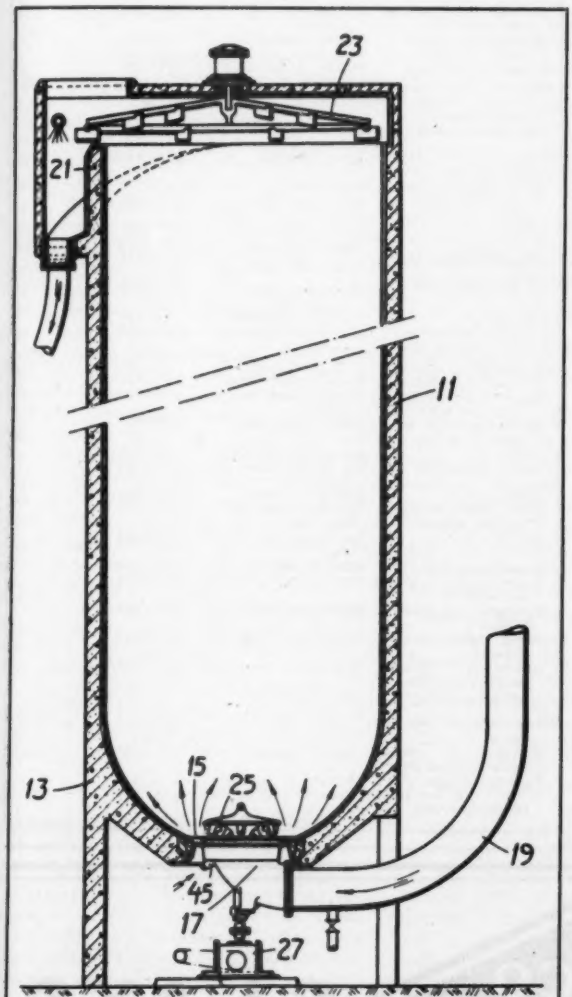


Fig. 7

In Fig. 7, a concrete bleaching tower 11 is shown, with a bottom pulp inlet 19. Pulp is forced in by pressure air feed, travels up through the tower, and overflows at 21. A rotary scraper 23 is arranged at the top of the tower in order to facilitate an even discharge of the pulp.

Above the bottom inlet is a rotor 25 driven at 100-300 rpm by a motor 27. The pulp leaves the rotor radially, as shown, and is distributed uniformly around the circumference of the tower. The rotor also serves as a mixer, preventing the gaseous bleaching

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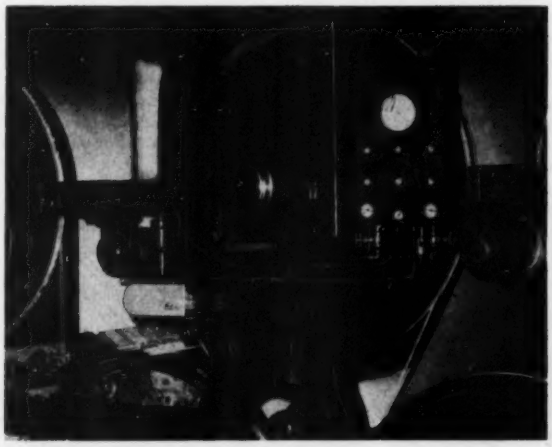

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Patent Reviews . . .

agent (e.g. chlorine) from rising in the tower before it has been thoroughly mixed into and absorbed by the pulp.

Apparatus for the preparation of wood chips

U.S. 2,764,289, issued Sept. 25, 1956, to Louis J. Schied and assigned to Watervliet Paper Co., describes apparatus for the preparation of wood chips in the manufacture of wood pulp.

The chipping operation is substantially a continuous operation as carried out in normal mill practice. By the use of the apparatus disclosed in this patent, it is also possible to carry out the soaking and flotation steps in a continuous manner, thus making the entire operation continuous.

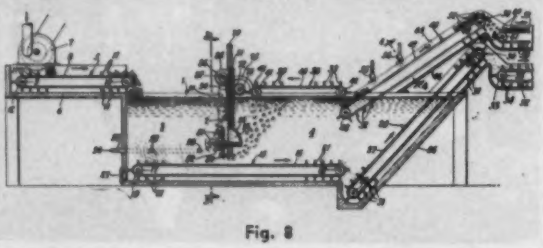

Fig. 8

As shown in Fig. 8, the apparatus consists of a soaking and flotation chamber which has an adjustable baffle 2 dividing it into two compartments connected by a fluid passage at the bottom. Compartment 3 functions primarily as a soaking compartment, and compartment 4 as a flotation compartment. Conveyor 5, extending from the pit 6 of a chipper 7, feeds a mixture of wood chips, slivers of bark, rotten wood and dirt into the soaking compartment 3. Conveyor 15 carries debris which sinks to the bottom of compartment 3 and delivers it to conveyor 25.

Wood chips are delivered from compartment 3 to compartment 4 by paddle 80 and are then moved by skimmer 38 to conveyor 45.

Manufacture of fiber board by extrusion

U. S. 2,759,222, issued Aug. 2, 1956 to Harold E. Bowers and assigned in part to Mathew F. Kritchever, describes a process for manufacturing extruded board.

The process consists of mixing water, starch, and fiber in the proportions of 5 parts of water, 4 parts of fiber, and one part of starch, heating the mixture to gelatinize the starch, extruding the mixture through a die under pressure, cooling the board to room temperature, then reducing the pressure on the board to atmospheric and drying and waterproofing the board.

Other Patents of Interest to the Pulp and Paper Industry

Subject	Inventor or Assignee	Patent No.	Date
Apparatus for forming sealing beads on removable paper closures for containers	Smith-Lee Co. Inc.	2,753,767	7/10/56
Apparatus for application of valve sleeves during tubing operation	St. Regis Paper Co.	2,753,768	"
Bag bottomer	St. Regis Paper Co.	2,753,769	"
Web corner box setting up machine	International Paper Box Machine Co.	2,753,770	"
Cover for carrying a pair of upright rectangular cartons as a unit	United Paper Box Co.	2,753,993	"
Reinforced bottle carrier	The Bergstein Packing Trust	2,754,028	"
Carton sealed by internal end flooding	The Bergstein Packing Trust	2,754,044	"
Paper containers	United Wallpaper, Inc.	2,754,045	"
Container with telescopic cover	Container Corp. of America	2,754,046	"
Paperboard can carton	Olympia Brewing Co.	2,754,047	"
Fiber-size emulsion	Wood Conversion Co.	2,754,206	"
Composite paper sheet	William A. Hermanson	2,754,236	"
Apparatus for treating boards molded of fibrous material	James d'A. Clark	2,754,540	7/17/56
Paintable hardboard	William J. Runckel and George R. Bethel	2,754,728	"
Molding of perforated pulp articles	Keyes Fibre Co.	2,754,729	"
Molded fiber-resin article	Keyes Fibre Co.	2,754,730	"
Tension regulator and guide control means	Beloit Iron Works	2,755,032	"
Cigarette paper	General Cigar Co., Inc.	2,755,207	"
Paper machine	Beloit Iron Works	2,755,710	7/24/56
Disposal of waste sulphite liquor	A. O. Smith Corp.	2,755,749	"
Article carriers	The Gardner Board & Carton Co.	2,755,959-65	"
Egg carton	The Diamond Match Co.	2,755,984	"
Producing moisture resistant coating webs	The Gardner Board & Carton Co.	2,756,164	"
Pulp-defibering apparatus	E. D. Jones & Sons Co.	2,756,646	7/31/56
Flow control apparatus	Kimberly-Clark Corp.	2,756,648-51	"
Bottle carrier with integral partitions	Container Corp. of America	2,756,900	"
Molded paper pulp egg carton	Louis Schwartzberg	2,756,918	"
Cartons	National Biscuit Co.	2,756,919	"
Unitary folding box	The Gardner Board & Carton Co.	2,756,920	"
Produce bag	Richard E. Adams	2,756,922	"
Latch formed by superimposed sheets	Equitable Paper Bag Co., Inc.	2,756,923	"
Mailing tube	Quality Park Box Co., Inc.	2,756,924	"
Coated paper products	Rohm & Hass Co.	2,757,106	"
Production of hot-pressed hardboard	Weyerhauser Timber Co.	2,757,113	"
Manufacture of glazed hardboard	Weyerhauser Timber Co.	2,757,114	"
Fitted, lignocellulose products	Weyerhauser Timber Co.	2,757,115	"
Manufacture of thermosetting cellulosic particle compositions	Weyerhauser Timber Co.	2,757,148-50	"
Production of hard fiberboards	Hermann Basler	2,757,583	8/ 7/56
Apparatus for removing waste from box blanks	Cornell Paperboard Products Co.	2,757,585	"
Paper bottle spout	Richard M. Hansen	2,757,830	"
Container unit and carrier for multiple units	Container Corp. of America	2,757,849	"

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FOREIGN ABSTRACTS

The Zimmermann process of wet combustion

After discussing the principles of the wet combustion involving spent liquors, the author outlines the differences between the Cederquist technique which deals with partial oxidation and the Zimmermann process which concentrates on complex oxidation.

The plant at Sarpsborg is based on the Zimmermann process, in place of an evaporation unit and waste liquor burner. In the case of the Zimmermann process the heat output is 50-60 per cent greater, and the wet steam production is 100 tons per hour, or 6.2 tons of steam per ton of pulp. The costs of the plant are discussed. Wet combustion requires a large power output, which is developed by steam from back pressure turbines, and by high pressure gases. The power which normally would be gained by back pressure turbines with steam from the conventional boiler house is lost. When power is expensive it pays to produce this from the net amount of steam formed by the Zimmermann plant.

The Zimmermann process is advantageous with respect to incrustations, and in cutting down the polluting effects of sulfur dioxide and ash. However the process fails to respond to rapid variations in load. Wet combustions not only serve from the standpoint of heat economy, but open new ways for chemical recovery from wood pulping operations.

Uses in the kraft and semicheimcal neutral sulfite pulping processes and discussed briefly and certain of the reactions are outlined.

Finn Blikstad. *Wochbl. Papierfabr.* 84, 687-90 (1956) (in German) and *Norsk Skogind.* 10, 172-80 (1956) (in Norwegian).

Evaporation and combustion of sulfite spent liquor

In Japan a new process for the disposal of calcium base spent liquor involves treatment of the liquor with sodium carbonate, evaporating the resulting, clarified soda base liquor without scale formation and burning the concentrated solution in a kraft smelter. The heat is recovered, and the sodium carbonate is regenerated by introducing flue gas into the smelt. Furthermore, sulfite rejects (like knots) can be pulped with kraft white liquor prepared from a part of the smelt, and heat and chemicals can be recovered in the same smelter.

Orienting analyses of spent liquor from several mills showed that for scale-free evaporation of spent liquor, the calcium salts (calculated as calcium oxide) should be less than 0.05 per cent by weight of the total liquor solids, and that for the subsequent combustion, the sodium salts (calculated as sodium oxide) should not exceed 25 per cent of the total liquor solids.

The treatment with sodium carbonate gave better removal of calcium at 80° than at room temperature, and the rate of removal and the settling of the calcium carbonate was most rapid when the carbonate was added as a suspension.

Eleven tables, 3 diagrams and 2 references are given. Tadashi Shogenji and Akio Mita. *Reports of the Govt. Chem Ind. Research Inst., Tokyo* 51, No. 5, 179-88 (1956) (in Japanese, with English summary) through *B.I.P. Chem.* 27, No. 1, 55-56 (1956).

A statistical study of the board Mullen tester

A system was devised to provide a continuous check on the performance of a Perkins board Mullen tester at the Botany mill of the Australian Paper Manufacturers Ltd.

This system uses control charts and it indicated that from time to time the results given by the tester diverted markedly from the standard. Repeated checks on the instrument failed to give the source of the trouble. The Perkins Mullen tester was then replaced by a Lorentzen and Wettres Mullen tester, which behaved much as did the Perkins model.

After testing several possible hypotheses as to the behavior of the testers, it was found that the Mullen tester depended in its performance on the temperature of the atmosphere in which it was used. Evidently the strength readings decreased with increasing temperatures. When the temperature is controlled it appears that there is little difficulty in controlling a Mullen board tester.

Gages are apt to lose their calibration and should be checked whenever there is an indication that the tester is out of control or when there is no apparent reason for the lack of control. Diaphragms were not a source of variation if they were selected to require a pressure of 40-50 psi to extend them to a height of 1.8 cm.

G. W. Knight. *Australian Pulp & Paper Ind. Tech Assoc. Proc.* 9, 249-265, discussion, 266-70 (1956).

Pulpwood billet production in Tasmania

The plant and operation of the wood mill preparing billets for mechanical pulping are described in detail.

The raw material, at the Boyer mill, is a mixture of Eucalypts (containing not less than 75 per cent *Eucalyptus regnans*, not more than 20 per cent *E. gigantea* and not over 5 per cent E. Obliqua). As they come to the mill, the logs vary from 1 to 9 ft. in diameter, and the lengths from 12 to 40 ft. The maximum weight for one bole is kept below 20 tons.

The Wood Mill section in which the logs are converted into billets has 4 sub-sections: (a) one for log handling including storage, barking preparation for milling, and for feeding to the sawmills; (b) a splitter mill which handles logs up to 40 in. in diameter and which operates 5 shifts a week; (c) the saw mill which handles logs up to 78 in. in diameter and which operates 10 shifts a week; and (d) a billet handling section which takes care of transportation, storage and delivery of the cur logs to the groundwood mill. All of these are described in detail.

Problems arising from sawing hard eucalypt wood and the handling reject material and sawdust are discussed. The importance of the basic density of the timber in selecting suitable sawing machinery is emphasized as are hazards encountered in cutting.

R. Moon. *Australian Pulp & Paper Ind. Tech. Assoc. Proc.* 9, 31-46; discussion 46-48 (1956).

Efficient beating

This is one of a series of papers dealing with the structure and properties of paper and was a study on beating as applied to kraft pulps.

Theories of beating and interfiber bonding, and the rheological methods used in characterizing changes in the sheet as effected by beating, are outlined. The pulps used were eucalyptus kraft. Colloidal material liberated in the beating process appeared to have little effect on the mechanical properties of the paper. Fines present in unbeated pulp appeared to exert a marked influence. The pulps were fractionated and the fractions beaten separately in a Lampén mill and then recombined. The original unfractionated pulp was also beaten under similar conditions. For the same amount of beating it seemed that the freeness decreased more for the recombined than for the original (unfractionated) pulp. By adding fines in varying proportions to the coarse fraction before beating it was shown that the maximum beating effect was obtained in the *absence* of the fines. So, whereas the presence of fines improve the mechanical properties, they appear to retard beating.

The authors discuss briefly the kinetics of beating. They also outline possibilities of simulating beating effects by chemical or physico-chemical means instead of by

purely mechanical treatment. An example would be a mild acetylation of the pulp.

Twenty six references are given. H. G. Higgins and K. J. Harrington. *Australian Pulp & Paper Ind. Tech. Assoc., Proceedings* 9, 71-90 (1955). This includes a discussion of the paper.

Pulpwood plantations in South Africa

The Union of South Africa is a poorly wooded country which has been very successful in its afforestation program.

These include extensive plantations of various exotic pines (690,000 acres), eucalypts (480,000 acres), and Austracian Black wattle (630,000 acres) which have been established economically. Australian eucalypts are managed on short rotation, and their growth rate in South Africa is about 350 cubic ft. per acre per year (in contrast to the growth rate in Australia of 50-100 cubic feet per acre, per annum).

Conditions in South Africa, in contrast to those in Australia, include cheap labor, little heavy clearing, no rabbits, and therefor no need for netted fencing.

W. G. Chandler. *Australian Paper & Pulp In. Tech. Assoc. Proc.* 9, 16-25; discussion 25-30 (1955).

Determination of 8-hydroxyquinoline in groundwood

The fungicide 8-hydroxyquinoline (termed "oxine") is used in conjunction with phenylmercuric compounds in wet mechanical pulps.

In determining the oxine, the pulp sample was air-dried, cut into small pieces, and 3 grams were weighed into a flask, treated with 35 cc. 0.1*N* hydrochloric acid, and digested 1 hr. at 90° C. The decanted acid solution was filtered into an erlenmeyer flask, and the pulp redigested as before.

In all, three such acid digestions were made, and all solutions were filtered through the same paper. The cooled acid filtrate was treated with 20 cc. chloroform shaken for one minute and filtered through a filter moistened to prevent the passage of chloroform which was discarded. The flask was rinsed with 5 cc. of the acid and this solution was also filtered and added to the rest. The combined filtrates were placed in a separatory funnel and treated with 2 cc. 0.001 molar copper sulfate and 15 cc. of a 3 molar solution of sodium acetate. This "oxinate" was then extracted with 20 cc. chloroform by shaking one minute and the chloroform extract filtered through a small layer of cotton wool into a spectrophotometer tube. The absorbency was then measured at 4100 A° (E_{410}).

The same procedure was the repeated in determining a blank in which the copper sulfate was *not* added, but replaced by 2 cc. of a dilute solution of the disodium salt of ethylenediamine tetraacetic acid. The blank value E_b was substracted from the value (E_{410}) for the corresponding pulp sample. The amount of oxine in micrograms was then read directly from a calibration curve, in which 0, 2, 4, 6, and 8 cc. of a standard oxine solution containing 50 mg. per liter of 0.1*N* hydrochloric acid) were used.

The precision of the method was about 90-100%. In the determination of the blank to be subtracted, the disodium ethylenediaminetetraacetic acid causes a complexing of all metallic ions that give rise to colored oxintates, so that the resulting only to resin, thus serving as an adequate absorbency of the chlorofoem layer is due blank.

P. O. Bethge, O. T. Carlsson, and S. K. L. Freyschuss. *Svensnsk Papperstidn.* 59, 591-2 (1956) (in English).

Preservatives for rot-proofing paper

Matched pieces of kraft paper were immersed in solutions or suspensions of 18 different preservatives. The impregnated specimens were then buried in a compost heap for 14 days at 30° C and at a relative humidity of 95-100 per cent.

Similar treated specimens were also tested under less drastic conditions, in which the papers were laid on the surface of agar containing mineral salts and sprayed with a suspension containing the spores of seven different fungi, followed by suitable incubation. The second test gave less complete information than did the more drastic one. Complete protection against rot without adversely affecting the bursting strength of the paper was afforded by any one of the following three treatments: 0.8 per cent phenyl mercuric acetate in water; 1.2 per cent sodium pentachlorphenate in water followed by dipping into an aqueous solution of copper sulfate and 9 per cent mercuric naphthenate in "mineral turpentine".

Preservative treatments that did *not* protect the papers in the compost burial tests included: creosote in mineral turpentine, copper 8-quinolinolate in mineral turpentine, and zinc dimethyldithiocarbamate (2 per cent in water).

The authors conclude that the service life of paper, cardboard etc. used in contacting moist soil may be increased materially by the preservative treatments, some of which can probably be applied during the actual manufacture of the paper. (Three tables and a series of half-tone illustrations are included.) E. W. B. Da Costa, A. J. Watson, and W. R. Hindson. *Australian J. Applied Sci.* 7, No. 1, 113-118 (1956).

Rayon pulp from Indian bamboo

The bamboo raw material contained 2.06 per cent ash, and 5.03 per cent alcohol-benzene extractives. The extracted sample gave 22.98 per cent lignin, 18.29 per cent pentosans and 71.66 per cent holocellulose. A prehydrolysis-kraft cooking procedure was carried out in accordance with Indian patent 51937 (May 1954) in a 150 kg digester, after a preliminary small scale run.

The yield of bleached pulp averaged about 33 per cent. Its ash content had been reduced to 0.1 per cent, probably the lowest hitherto obtained from bamboo. The pulp pentosan was 3.46 per cent, and the alphacellulose was 96.5 per cent. The alcohol-benzene solubility had been reduced to 0.3 per cent; the degree of polymerization was 820.

This pulp was then put through the entire viscose process and was converted into yarn. Apparently it passed successfully through the steeping, shredding, ageing, xanthation, dissolving, filtration and spinning operations, and the staple fiber and tire cord made from the viscose were comparable in their textile properties to those made from normal rayon-grade pulps manufactured from other raw materials by other techniques. The authors claim that the problem of making "rayon grade pulp from bamboo has been solved". Fourteen references. V. P. Gohel and L. Thoria. *Indian Pulp and Paper* (Anniversary No.) 11, No. 1, 33-36 (1956).

"Carnaubic acid" from tall oil

This acid, melting 72.5-73.5° obtained from tall oil and pitchy wood by Bergström and Trobeck (*Svensk Papperstidn.* 50, 9, 215 (1947) was reinvestigated.

Mono-layer determinations and mass spectrographic techniques were used, and it was found that this "carnaubic acid" was in fact a mixture of about 72-76 molar per cent of *n*-docosanic (behenic) acid and 24-28 per cent *n*-tetracosanic (lignoceric) acid. A trace of the straight chain C_{26} acid is also present.

Because of difficulties in the mass spectrometry of the higher fatty acids, this analysis was carried out with appropriate mixtures of the corresponding alcohols obtained by reducing the acids with lithium aluminum hydride.

Seventeen references and 13 figures are included. Hildig Bergstrom, Ragnar Ryhage, and Einar Stenhagen. *Svesnsk Papperstidn.* 59, 593-598 (1956) (in English).

Calcium in chemical pulps

Calcium determinations were made on six rayon grade pulps, both by a titration method in general use and by means of a flame photometric procedure using a Zeiss type III photometer. The latter method gave more accurate results and could be used more rapidly and economically than could the former. The photometric technique was found suitable for calcium concentrations of 0.01 to .001 per cent and is suggested for routine testing of dissolving pulps.

Four tables, 4 figures and 7 references are included. Janina Kaszynska. *Prace Instytutu Celulozowo-Papierniczego* 4, No. 2, (7) 55-60 (1955) (original in Polish, with Russian and English summaries) through *Bull. Inst. Paper Chem.* 27, 196 (1956).

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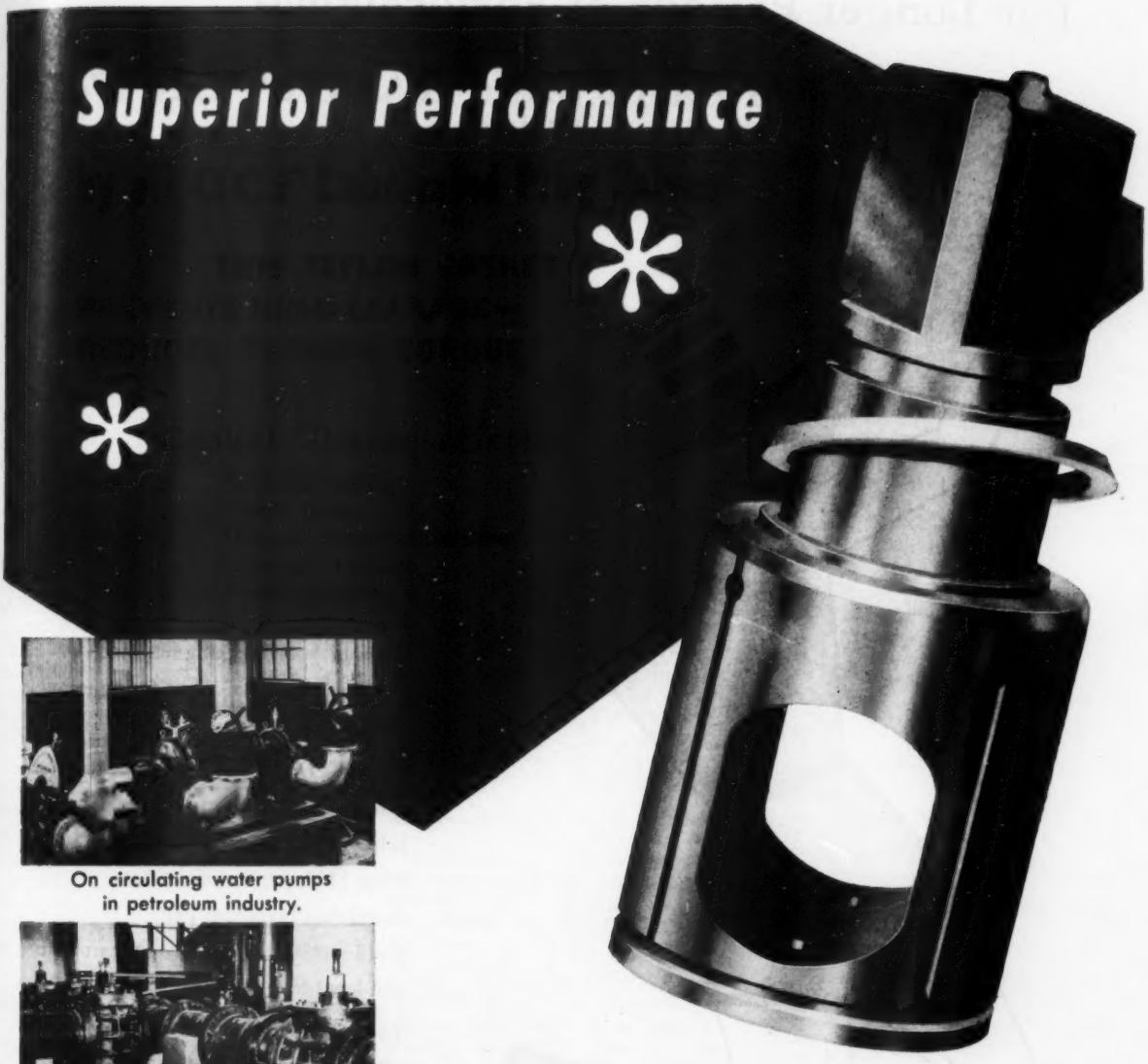
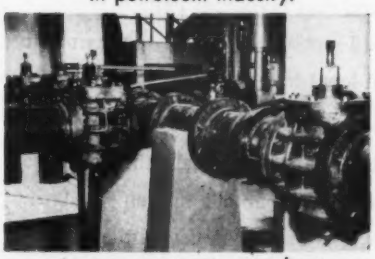
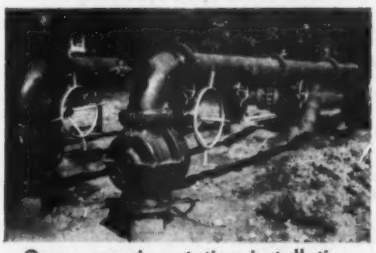


On circulating water pumps in petroleum industry.



In sewage treatment plant.



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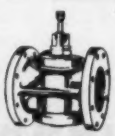

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SAFETY NEWS

72 Perfect Scores Recorded by NSC Contestants for Nine Months

FOR THE NINE-MONTH period ending September 30 a total of 72 contestants maintained perfect scores in the 1956 Paper Industry Safety Contest sponsored by the National Safety Council. Some 540 plants are entered in the competition.

For the same period last year, 65 perfect scores were recorded.

The January-September frequency rate for all divisions was 7.07, down 6 per cent from a year ago. In the Pulp and Paper Division the nine-month rate was 6.72, down 9 per cent; in Paper Converting 8.03, down 1 per cent, and in Pulpwood Logging 55.09, down 38 per cent.

Contestants working the most accident-free hours in the first nine months were Crown Zellerbach Corp. at Port Townsend, Wash.; Munising Paper Co. at Munising, Mich., and Marinette Paper Co. at Fort Edward, N. Y.

Perfect scores through September were as follows:

Division I—Pulp and Paper Mills

Group A

No perfect scores.

Group B

Crown Zellerbach Corp., Port Townsend, Wash.; Munising Paper Co., Munising, Mich.; Georgia Kraft Co., Macon, Ga.

Group C

Schmidt & Ault Paper Co., York, Pa.; Falls Paper & Power Co., Oconto Falls, Wis.; National Vulcanized Fibre Co., Yorklyn, Del.; Fraser Companies Ltd., Newcastle, N. B.; St. Regis Paper Co., Sartell, Minn.; Congoleum-Nairn Inc., Cedarhurst, Md.

Group D

Certain-Teed Products Corp., East St. Louis, Ill.; Certain-Teed Products Corp., Savannah, Ga.; Owens-Illinois Glass Co., National Container Corp. Div., Big Island, Va.; Certain-Teed Products Corp., Niagara Falls, N. Y.; Mead Corp., Wheelwright Div., North Leominster, Mass.; Container Corp. of America, Ogden Ave. Div., Chicago; Bartgis Bros. Co., Ilchester, Md.; Marathon Corp., Ashland, Wis.; Container Corp. of America, Chattanooga, Tenn.; Riegel Paper Corp., Hughesville Mill, Riegelsville, N. J.

Group E

Celotex Corp., Avery, Ohio; Flintkote Co., Mount Carmel, Ill.; Kimberly-Clark Corp. of Canada Ltd., Kapuskasing, Ont.; United States Gypsum Co., Oakfield, N. Y.; Robertson Paper Box Co. Inc., Montville, Conn.; International Paper Co., Livermore Falls, Maine; United States Gypsum Co., Gypsum, Ohio; Johns-Manville Corp., Tilton, N. H.; National Vulcanized Fibre Co., Marshall Bros. Div., Yorklyn, Del.; Spaulding Fibre Co. Inc., North Rochester, N. H.; Banner Fiberboard Co., Wellsburg, W. Va.

Division II—Paper Converting

Paper Bags

Thilmany Pulp & Paper Co., Kaukauna, Wis.; St. Regis Paper Co., Dryden, Ont.; Pillsbury Mills Inc., Wellsburg, W. Va.; St. Regis Paper Co., Playa Ponce, P. R.

Boxes and Cartons

Group A

Bartgis Bros. Co., Ilchester, Md.; Container Corp. of America, Medford, Mass.; Container Corp. of America, Rock Island, Ill.; Robertson Paper Box Co. Inc., Montville, Conn.; Mengel Co., Louisville, Ky.

Group B

Container Corp. of America, California Container Corp. Div., Boyle Ave., Los Angeles; International Paper Co., Container Div., Kansas City, Kans.; Container Corp. of America, Carton Div., Chattanooga, Tenn.; Crown Zellerbach Corp., Gaylord Container Corp. Div., Tampa, Fla.; Container Corp. of America, Baltimore; Mengel Co., Winston-Salem, N. C.; Container Corp. of America, Carton Div., Cleveland.

Marathon Corp., Sunnyside, Wash.; Container Corp. of America, Container Div., Boston; Fort Wayne Corrugated Paper Co., Rochester, N. Y.; Container Corp. of America, Carton Div., Seattle; Container Corp. of America, Container Div., Cleveland; Hankins Container Co., Little Rock, Ark.; Mott Carton & Paper Co., St. Louis; Owens-Illinois Glass Co., National Container Corp. Div., Miami.

Roofing Paper

Ruberoid Co., Dallas, Texas; Bird & Son inc., Chicago; Ruberoid Co., Minneapolis; Johns-Manville Corp., Marrero, La.; Certain-Teed Products Corp., Dallas; Johns-Manville Corp., Los Angeles; Flintkote Co., Portland, Ore.

Insulation and Building Board

No perfect scores

Specialties

Scott Paper Co., Fort Edward, N. Y.; Kimberly-Clark Corp., Niagara Falls, Ont.; Lily-Tulip Cup Corp., Augusta, Ga.; Marinette Paper Co., South Glens Falls, N. Y.; Sefton Fibre Can Co., Piqua, Ohio; Scott Paper Co., Sandusky, Ohio; Line Material Co., Texas Fibre Products Plant, Sherman, Texas; Sefton Fibre Can Co., New Orleans; Kimberly-Clark Corp., Winnipeg, Man.; Mid-West Wax Paper Co., Fort Madison, Iowa; Lily-Tulip Cup Corp., Monticello, Ind.

Division III—Pulpwood Logging

No perfect scores

Eight Perfect Records Reported for Nine Months by SPPSA

A TOTAL OF eight perfect scores have been reported for the nine-month period by participants in the annual competition sponsored by the Southern Pulp & Paper Safety Association. Of these, four are mills; two bag plants; one box plant, and one woods operator.

In the mill division, Georgia Kraft Co. at Macon, Ga., leads with a 0.00 frequency rate in 972,025 man-hours of exposure. Safety supervisor at Georgia Kraft is W. M. Sloan Jr.

For the nine months of 1956, the average frequency rate for the 63 participants among pulp and paper mills was 6.73. Last year the rate was 7.43, while in 1954 it was 7.32.

Other perfect scores among the mills, with man-hours shown in parentheses, were: Certain-Teed Products Corp., Savannah, Ga. (324,609); National Container Corp., of Virginia, Big Island, Va. (313,605) and Banner Fibreboard Co., Wellsburg, W. Va., (56,759).

Converting Industries

Leader among the bag plants was Kraft Bag Corp. at St. Marys, Ga., where a perfect score was recorded

Safety News . . .

in 371,743 man-hours. Safety supervisor at Kraft Bag is M. C. Petersen.

The average frequency among all bag plants was 6.61. For the year 1955 it was 4.22 and in 1954, 4.53.

The one perfect score made in the box plants was at St. Joe Paper Co. at Port St. Joe, Fla., with 180,014 man-hours. Safety supervisor at St. Joe is W. L. Winters. The average frequency among all box plants was 7.88. For the year 1955 it was 8.77 and in 1954, 11.20.

The one perfect score made in the woods operations was recorded by North Carolina Pulp Co. at Plymouth, N.C., with a 276,094 man-hour exposure. Safety supervisor at North Carolina Pulp is H. B. Gaylord. The average frequency among all woods operations was 22.04. Last year it was 13.90 and in 1954, 19.61.

Axe Handles, Too...

In addition to the large pulp manufacturers, more than 30,000 small business operators are engaged in the cutting, bucking and transporting of approximately 27,000,000 cords of pulpwood each year.

In the United States each person engaged in pulpwood operations worked an average of 8.3 months during a recent year. At least 250,000 workers are now employed annually on a part-time basis.

A tremendous amount of tools, equipment and fuel is required in such facets of the operation as transportation, cutting, bucking, splitting, peeling and handling. The American Pulpwood Association has estimated the tool and equipment requirements for a recent year as follows:

Hand Axes	130,000
Hand Saws	100,000
Power Saws	25,000
Tractors	7,000
Trucks	31,000
Trailers	2,600
Cranes and Shovels	500
Logging Sulkies and Arches	500
Loaders	1,000
Road Graders	400
Snow Plows	700

To operate this vast army of mechanized equipment it has been estimated that between 60,000,000 and 80,000,000 gal. of gasoline and other liquid fuels are consumed.

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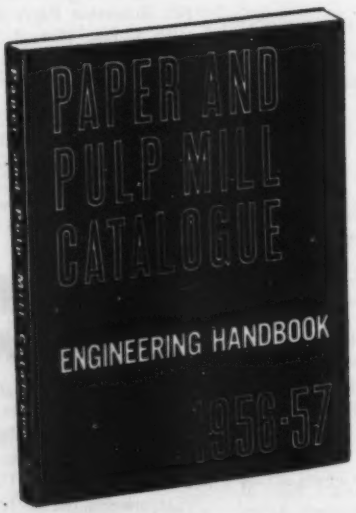

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NEW PRODUCTS

These items are numbered for your convenience. Further information on the various products described may be requested at no obligation through our Readers' Service Dept. Use the business reply card in this issue.

11/ Use readers' service card.

Automatic fire door operator

In some paper mills, it has been necessary, for fire prevention reasons, to maintain a fire door in a doorway leading from an exterior warehouse to an interior department storing fresh skids of pulp lapping.

A study made by Glatfelter officials, disclosed that each fork-truck driver passing through the doorway was forced to stop his truck, get off and open the door, go back to his truck, and then proceed through the doorway. To close the door, this procedure was repeated.

To solve this problem, a Prest-O-Matic fire door operator was installed. The picture above shows the door in operation.

Not only valuable time was saved by this installation, but the amount of dirt and dust which would enter the pulp storage area was decreased. *Clark Door Co.*

12/ Use readers' service card.

Decolorizing agent for rag-paper mill use

Vatrolite, the decolorizing agent, specially processed, granular, concentrated sodium hydrosulphite, is recommended for use in stripping colors from the rags used in bond paper production. It is claimed that Vatrolite even removes certain vat colors from rags, it can also be used with equal effectiveness in bleaching china clays used to size coated papers.

The manufacturer insures that Vatrolite is dust free, which makes it easy and clean to use in dry chemical feeding devices. The agent is also known to dissolve instantly.

Vatrolite is shipped in steel drums containing 250 lbs. net. It can be kept in storage almost indefinitely, provided moisture is prevented from entering the container. *Royce Chemical Co.*

13/ Use readers' service card.

Circuit breaker

Announcement has been made of a new breaker design which permits space savings in the ultimate size of the equipment in which it is incorporated, and at the same time simplifies stocking by making possible standardization on a single equipment design.

The new compact 800-ampere molded case circuit breaker is 6½ in. shorter than conventional breakers.

The new breaker is called the "KM breaker" and is available in ratings from 125 to 800 amperes. *General Electric.*

14/ Use readers' service card.

New adhesive

A new adhesive called Chemlok 220 has been developed for the bonding of uncured natural and synthetic rubbers to metal with a one-coat application.

One coat of this new adhesive is said to produce a bond of greater strength than that obtained with conventional two-coat adhesives with comparable environmental resistance. There is a superior bond resistance to adverse conditions such as wide temperature variations. *Lord Manufacturing Co.*

15/ Use readers' service card.

Water conditioner

A water conditioner has been developed which, when operating, works without chemicals, has no moving parts, and requires no servicing or maintenance.

This unit looks like a section of heavy piping with a bulge at the top, has two parts — a dispersing cell containing a kinetic energy generator and a homogenizing chamber. Together, the two units impart added energy to atoms of the water solution.

This action prevents scale from forming, as well as gradually dissolving scale already existent, keeping it in suspension within the water system, or draining off with normal usage of water, depending upon the system. *Packard Water Conditioning Division Inc.*

16/ Use readers' service card.

Paper rewetting agent

A recently developed chemical called Keripon NC, may be used in the manufac-

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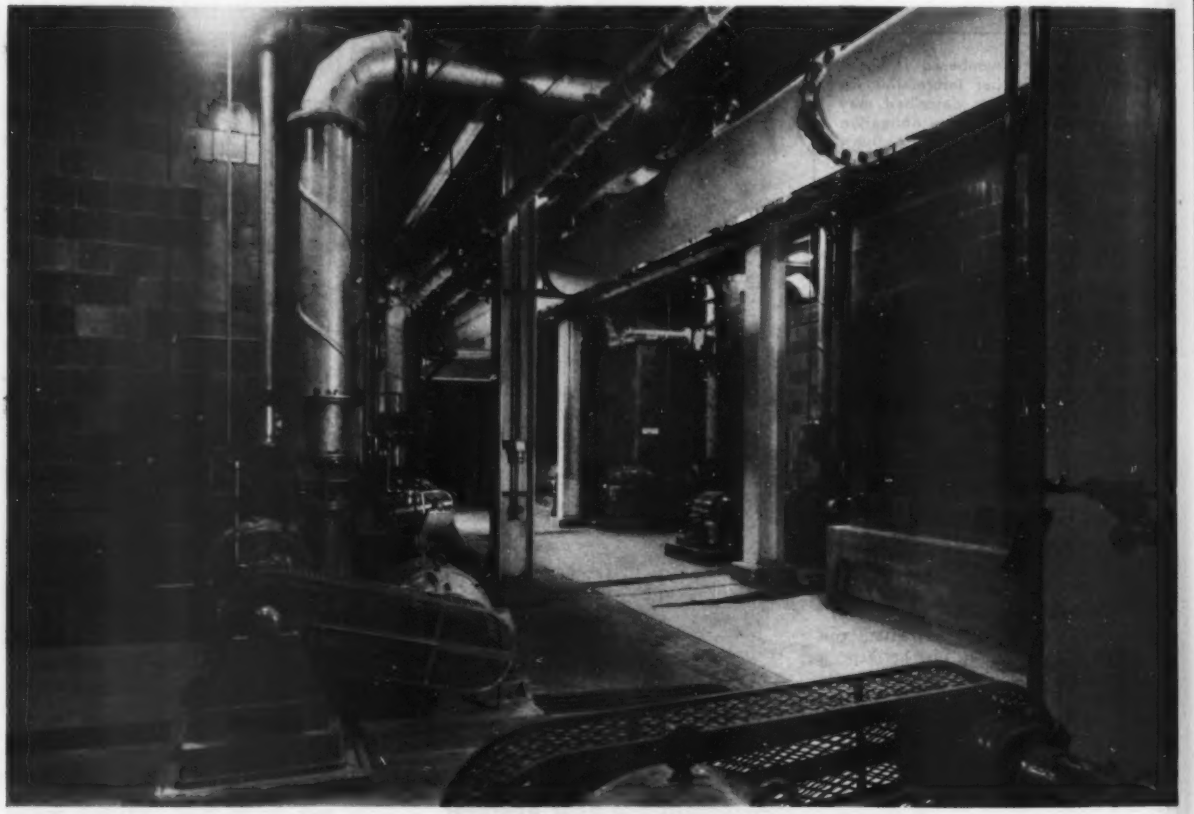

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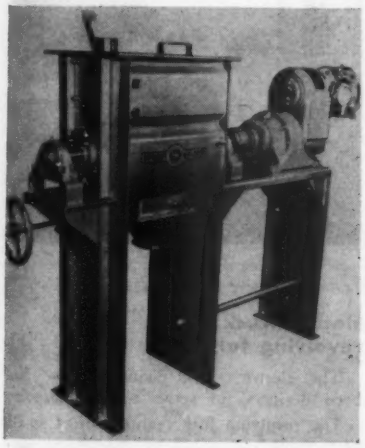
ture of paper to impart superior absorbency of moisture, which is retained over an extended period even after accelerated ageing or prolonged storage.

In addition to the chemicals outstanding wetting and rewetting properties, it has a low foaming action.

It has been found that regardless of the paper machine furnish, 1-¼ pds. of Keripon NC per ton of air dry pulp in the beater will give a maximum absorption time (0.1 ml. water) of less than 25 sec. after accelerated aging at 105 C for one hr.

In the case where the rewetting agent is to be added at the fan pump by means of flow meter, Keripon LV should be used. Keripon LV is Keripon NC with an adjusted viscosity to permit proper flow through the orifice of the meter. *Arkansas Co. Inc.*



17/ Use readers' service card.

Laboratory mixer

Pictured above is the small horizontal mixer which is designed for such applications as coating mixing, starch cooking, bleaching studies, and laboratory operations where excellent mixing is required in processing. It is especially designed for pulp and paper applications. *Sprout, Waldron & Co. Inc.*

18/ Use readers' service card.

Lignin sulfonate chemical

This new surface active chemical has uses such as: an emulsifier, a binder for fibers, retention of fines, an emulsion stabilizer, a flocculant, and a dispersant.

Known as Orzan P, this chemical has the unusual property among lignin sulfonates of precipitating readily from solutions and clinging to fibers or other materials present. It is a spray-dried powder and may be precipitated from even dilute solutions by the addition of alum. *Crown Zellerbach Corp.*

19/ Use readers' service card.

Panel raceway for wiring

A Panel Chanel raceway has been developed to permit quick wiring of electrical and electronic equipment with pre-cut wires already equipped with solderless connectors.

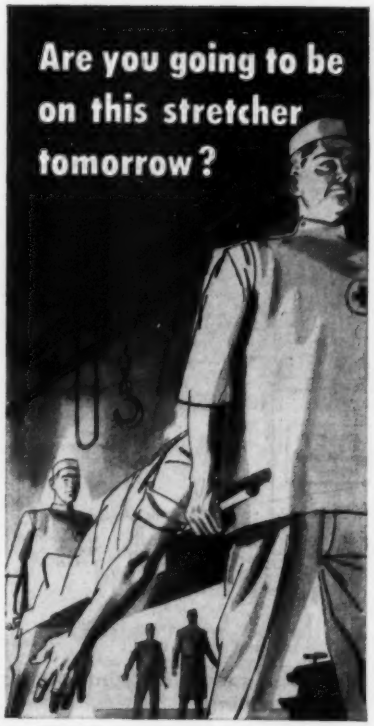
This panel eliminates wire bundling and lacing in wire grouping operation. Manufactured sizes are from 1 in. x 1 in. to 4 in. x 4 in. *Stahlin Brothers Inc.*

20/ Use readers' service card.

Gear pump

This new pump, suitable for fluid pressure up to 200 psi., can be readily adapted for a multiplicity of applications including: engine oil pumps, primary pumps for fuel injection systems, for automatic transmissions, for oil burners, for low-pressure machine tool mechanism and other types of applications.

The pump illustrated above is one version of the family of designs that can be tailored to suit any kind of installation. The housing, gears, and formation of the



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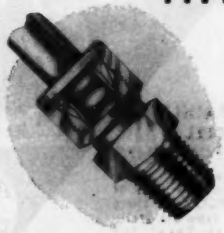

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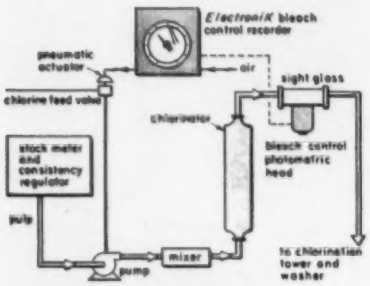
New Products . . .

molded control elements, as well as spring calibration, all can be modified to fit a specific application. *New Products Corp.*



21/ Use readers' service card.

Brightness meter for controlling pulp bleaching

The Black Widow automatic bleach control and Brown ElectroniK Circular chart recorder with pneumatic proportioning control take the guesswork out of pulp bleaching. They continuously measure the quality of treated pulp to reflect light and automatically control the feed of the bleaching agent in response to this measurement.

The diagram above shows the system where Black Widow and the Brown recorder are in use.

The instrument can be used as a relative brightness indicator and recorder at any point where pulp of a constant consistency can be observed. *Minneapolis-Honeywell Regulator Co.*

22/ Use readers' service card.

Stainless welding electrodes

Two new series of coated stainless electrodes have been developed which produce high quality welds with unusual operating ease.

One, known as Aerocor, is designed for welding light-gauge stainless steel. The other, called Fabricor, is designed for welding stainless plate.

Once the arc is established with either type electrode, it is possible for the operator to use a "drag-type" welding technique. *Arcos Corp.*

23/ Use readers' service card.

Brakemotors

Reliance Electric has introduced a new line of rugged, cast-iron brakemotors that stop instantly and are designed to hold heavy loads.

The motors feature a wide torque range from 3 lb.-ft. to 345 lb.-ft., friction linings for quick stops, and one-operation torque setting.

Another feature is that in the event of power failure or low voltage, "dead man" operation sets and holds the load until normal operation is restored.

All types of enclosures are available including those suitable for outdoor installation or where extremely moist, corrosive, or abrasive dust conditions exist. *Reliance Electric & Engineering Co.*

24/ Use readers' service card.

Electric truck with revolving fork

The electric truck pictured above has been designed to serve a dual purpose.

The revolving fork feature allows small parts to be dumped from steel boxes into hoppers. When the forks are in a normal position the truck is used to stack boxes in storage areas.

The forks move in a continuous 360° arc in both clockwise and counterclockwise directions. Movement is controlled by a hand operated hydraulic valve.

This device can be installed on any 4000-lb. capacity Straddle truck made by the manufacturer. *The Raymond Corp.*

25/ Use readers' service card.

Double strand roller chain sprockets

The new double strand sprockets incorporate the same Taper-Lock principle used in mounting other Dodge products, such as single strand sprokets, V-belt sheaves, conveyor pulleys, and flexible and rigid shaft couplings.

This modern method enables users to take sprockets, together with bushings of

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the desired shaft size, directly off the shelves of distributors and mount them quickly and securely without reboring, keyseating or set-screw machining. This provides the equivalent of a shrunk-on fit, regardless of whether the shaft is turned and ground or cold rolled, standard or normally undersized. *Dodge Manufacturing Corp.*

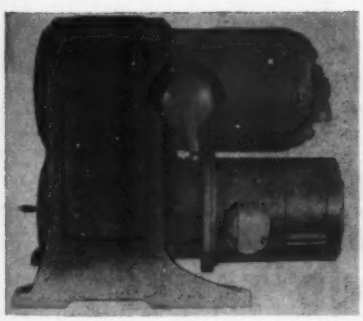
26/ Use readers' service card.

Spray nozzle for marking gun

The picture above, shows the new and easy-to-use spray gun for marking trees.

Lugging a heavy bucket and the slopping of paint can be done away with by the use of this easy spary gun method.

The Nelson Co. has developed this nozzle as an attachment to the "Nel-Spot Marking Gun." It is interchangeable with the regular nozzle of the gun and can be carried in the pocket when it is not in use. *The Nelson Co.*



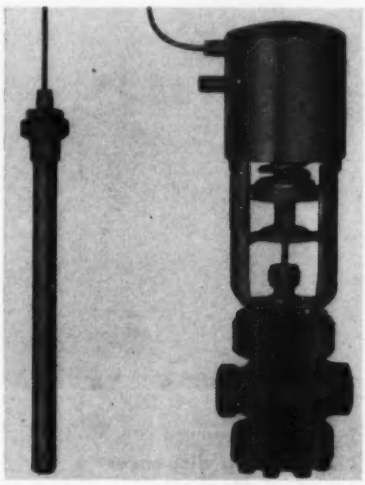
27/ Use readers' service card.

Power unit for multiple drive system

The Varidyne power unit is now designed with the drive motor and alternator on the same side—an important point where limited space is a factor.

This system has converted standard 60-cycle, 3-phase, ac squirrel-cage motors into varible speed motors. The alternator, driven at variable speeds, generates a frequency to each of the Varidyne motors in the system.

By changing speeds at the power unit by means of a handwheel, each motor in the system varies equally and simultaneously. *U.S. Electrical Motors Inc.*



28/ Use readers' service card.

Stainless steel temperature regulator

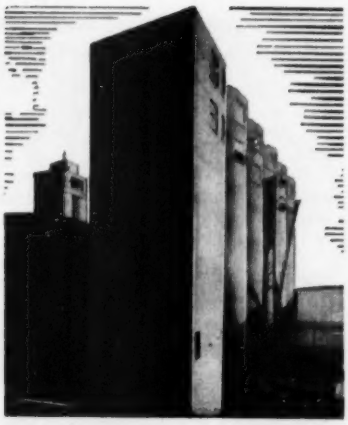
Known as the No. 11061-R, this new regulator was developed mainly for use in chemical plants. It is designed to withstand the corrosive effects of certain fumes, gases, acids and chemicals.

The temperature regulator is available in sizes from ¼ in. to 4 in., and in temperature ranges between 20°F. and 455° F. *Robertshaw-Fulton Controls Co.*

29/ Use readers' service card.

Open-end steel bins

Made of corrugated steel, the U-shaped bins are accessible from either end for



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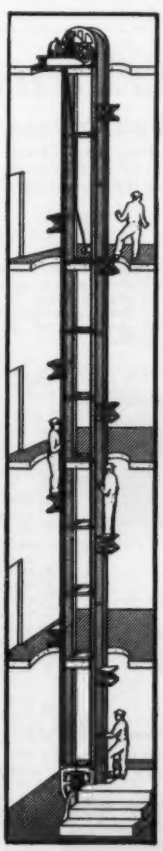

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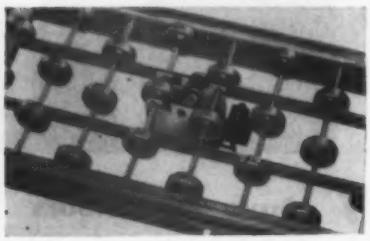
loading or unloading, and can be moved and stacked in any available area in the mill.

Bins are made: 36 in. high, 36 in. wide and 52 in. deep. The open-end design provides for excellent handling of rolls.

The units are handled by a fork-lift truck, and can be tiered to any convenient height. *Republic Steel Corp.*



30/ Use readers' service card.

Automatic case counter for use on conveyor lines

Traffic count on cases passed along by conveyor lines can be made automatic by the use of this counter.

Installation of the counter to the conveyor is made without the use of tools—it is merely hooked to the conveyor.

The counter can be positioned for flow counting in either direction by simply hooking the unit over the axles of a conveyor line when the flow direction changes.

This unit carries totals up to 99,999 and is known as the Rapistan automatic case counter. *The Rapids-Standard Co., Inc.*

31/ Use readers' service card.

Power strap dispenser for steel strapping

This mill-type dispenser enables the shipping room to easily keep pace with today's high-speed production lines. Thus, bottlenecks caused by slow, manual methods of measuring and cutting heavy-duty strap are eliminated, and efficiency is increased.

Among the principal advantages of this power strap dispenser are its simplicity and safety in operation.

A handy push-button enables the operator to control the length of strap fed through the cutter jaws. When the right length of strap has passed through, the button is released and the strap halted. Pulling the cutter handle toward himself, the operator quickly severs the strap.

This machine feeds strap through the cutter jaws at a rate of 6 to 10 ft per sec. Cutting requires only 2 to 4 sec. *Signode Steel Strapping.*

32/ Use readers' service card.

Plastic tubing

Marken Plastics Corp. has now entered the field of pipe manufacturing. They are offering a full line of both rigid (PVC) and flexible (Polyethylene) pipe and tubing. The sizes range from ⅜ in. to 4 in. with all types of fittings. *Marken Plastics Corp.*

33/ Use readers' service card.

New ion exchanger cleaner

When zeolite and other cation exchangers may lose exchange capacity when they be-

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Askania Regulator Company NEWS

Automatic Controls for
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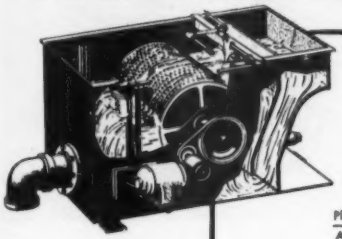
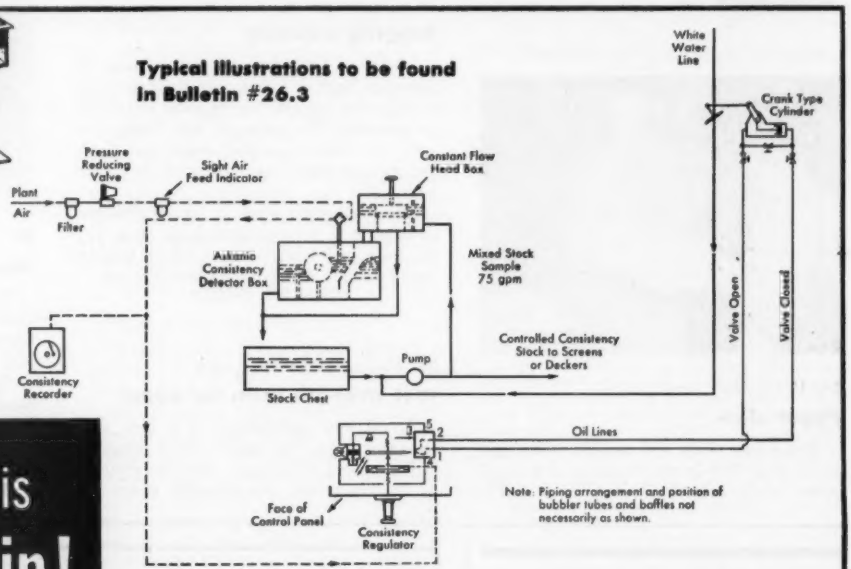


Typical illustrations to be found in Bulletin #26.3



You'll want this New Bulletin!

Shows how exclusive Askania Thin Stock* Consistency Control Systems assure increased production of better quality pulp

ASKANIA REGULATOR APPLICATION BULLETIN #26.3 provides practical information extremely helpful to those interested in automatic control of Consistency, Flow Rate, Stock Level, etc. for *increased production* of better quality pulp.

1 This bulletin shows how ASKANIA'S exclusive control systems and individual control units are easily applied to *both* new and existing pulping processes.

2 By means of diagrams it fully describes the operation of Askania's Automatic Thin Stock Consistency Control systems pointing out the individual components and describing the function of each.

3 It details the results you may expect from the control, such as maximum tonnage, less waste of good fibre, chemical savings, etc.

4 It emphasizes the vital importance of maintaining uniform conditions—and *how* these conditions are achieved with Askania control systems.

5 It cites one example of a 20,000 gallon water savings accomplished by changing a .35% consistency screening to a .5% screening—from which you may be able to evaluate the percentage of pumped water you might save in your own process.

6 It discusses the relationship between drainage rate and consistency detecting.

7 This bulletin carefully describes the functions of the Thin Stock Consistency Detector Box—shows how and why it works as it does.

Practical Information

This bulletin is written to help translate the meaning of ASKANIA Thin Stock Consistency Control in terms of *your own specific problems.*

**0.1 to 1.5% air dry consistency*

Look at a partial list of illustrations:

1 Relationship between Consistency and Frictional Pressure Loss

2 Thin Stock Consistency Control System

3 Stock Level Control System

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WHEN they should be used

WHICH controls should be used to meet specific problems

WHY Askania Automatic Controls will be most efficient and get the best results for you.

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New Products . . . . . .

come fouled with precipitated inorganic materials, biological growths etc., a new chemical called "Kleen-ion" can be used to overcome these problems.

Kleen-ion will aid in cleaning the zeolite bed, decreasing pressure drop caused by fouling and restoring the softening capacity. Kleen-ion can be used also to keep the zeolite clean — preventing future fouling. *W. H. & L. D. Betz*

34/ Use readers' service card.

Paper slide

The paper slide is a device which can be of great help in the handling of finished paper in the mill. It is designed to facilitate piling of paper on skids and deter costly "scuffing".

Developed and tested under actual mill conditions, the "Papercraft 36" paper slide is rapidly proving its popularity with paper mills.

Its sturdy, yet lightweight, plastic construction makes the slide an easy device for paper handlers to use. *The Papercraft Specification Co.*

35/ Use readers' service card.

Bagging machine

This bag packager opens and loads all types of bags, but has special application to bags that are affected by static electricity or tackiness. The packager will handle not only lip bags, gussetted bags, but flush cut polyethylene bags, as well as paper bags.

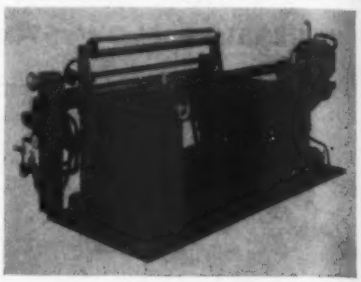
The packager is made in several different models. It is used to open bags from 3½ in. wide to 24 in. wide and with lengths up to 39 in. *Errich International Corp.*

36/ Use readers' service card.

Wet strength resin for paper

Actual mill applications of a new wet-strength resin for paper called Panalon WS provided advantages over conventional beater-applied, wet-strength resins.

Panalon WS is designed to produce wet-strength treatments on paper by surface application. It is found that uniformity and reproducibility of treatment are made possible through surface application using this chemical. *E. I. duPont de Nemours & Co. Inc.*



37/ Use readers' service card.

New unwind stand

This new unwind stand has an Askania automatic edge guide and handles web widths up to a maximum of 52 in. and roll diameters up to a maximum of 52 in.

The parent roll is supported by an Aero-Shaft which through air-pressure locks the roll to the brake. The new machine also has a water cooled, air-loaded brake controlled by a dancer roll. *Paper Converting Machine Co.*

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NEW LITERATURE

Books

ORGANIC CHEMISTRY. By Louis F. Fieser and Mary Fieser. Published by Reinhold Publishing Corp. 430 Park Avenue, New York 22, N. Y. 1,150 page. $10.00.

This book is the new third edition. It is completely revised from the second edition. It develops in orderly sequence the principles and concepts of modern organic chemistry and the applications of the fundamental science to technology and to biochemistry and medicine.

The new developments which have come into being since the printing of the second edition are all included in this third edition. New light is thrown on structures and total synthesis of important fatty acids, carbohydrates, peptides, enzymes, alkaloids, isoprenoids, tropolones, steroids, and antibiotics.

As a means of catching up on new developments, this edition should be of great help to research chemists in the process industries.

MODERN CHEMICAL PROCESSES. By the editors of Industrial & Engineering Chemistry. Published by Reinhold Publishing Corp. 430 Park Avenue, New York 22, N. Y. 197 pages. $5.00.

This is the fourth volume in the series of modern production methods in the chemical and process industries.

This edition follows the same pattern as did the previous volumes. Nineteen recently developed chemical processes now in operation are described in detail on: background—including commercial and technical history; description of plant installation—including design of non-standing items; description of process and operation of plants; economics of process; personnel, and future prospects.

Chemical engineers will find this volume and the previous volumes to be an aid in reference work on the latest and most modern production methods in the chemical and process industries.

A WORLD GEOGRAPHY OF FOREST RESOURCES. By Haden-Guest, Wright and Teclaff. Published by Ronald Press Company, 15 East 26th St., New York 10, N. Y. 736 pages. $12.50.

This book deals largely with forests as the source of essential raw materials, telling what these materials are and where they come.

Problems which face us today on our forest resources are discussed in the book.

Anyone concerned with the present and future of the world's natural resources will find this book to be very useful.

POLYESTERS AND THEIR APPLICATIONS. By Bjorksten, Tovey, Harker and Henning. Published by Reinhold Publishing Corp. 430 Park Avenue. New York 22, N. Y. 585 pages. $10.00.

This book contains a comprehensive survey of the entire polyester field from raw materials to fabricated product.

The information found in this book has been assembled by the Bjorksten Research Laboratories. It includes, 3300 references on most phases of the production and use of polyesters.

The authors of this book are planning to publish supplements to this edition in order that up-to-date trends and developments may be at hand.

USDA Reports

PUBLICATIONS OF THE LAKE STATES FOREST EXPERIMENT STATION. (Station Paper No. 39 dated July 1956.) By L. P. Olsen and H. A. Woodworth. Issued by Lake States Forest Experiment Station. This Station Paper lists the publications of the Lake States Forest Experiment Station since it was established in 1923. A study of the titles over the past 33 years and their dates of publication gives a fair indication of the advance in knowledge of forestry practices in the territory served by the station: Michigan, Wisconsin, Minnesota, and North Dakota.

GUIDE FOR SELECTING SUPERIOR FOREST TREES AND STANDS IN THE LAKE STATES. (Station Paper No. 40 dated September 1956.) By Paul O. Rudolf. Published by Lake States Forest Experiment Station. This is a 31-page booklet published as a guide for the selection of superior forest trees and stands. The booklet begins with a suggested program and follows with chapters on: What to look for; Traits of importance in all species; Traits of importance in particular species; Superior trees for special purposes; and Selection of high-quality stands.

FOREST TENT CATERPILLAR. By Harold O. Batzer and William E. Waters. Forest Pest Leaflet 9 dated July 1956. Issued by U. S. Department of Agriculture Forest Service. Following the pattern as the previous Forest Pest Leaflets, this leaflet contains the authors' study of the forest tent caterpillar.

A LISTING OF TECHNICAL NOTES. Published by the Lake States Forest Experiment Station. All notes listed below are one-page data sheets. You may request, by number, one or all of these notes.

No. 463—Site Index Curves for Jack Pine in the Lake States; No. 464—Site Index Curves for Aspen in the Lake States; No. 465—Site Index Curves for Balsam Fir in the Lake States; No. 466—Severe Winter Damage to Conifers Noted in Portions of North Dakota, 1955-56.

Manufacturers' Publications

These items are numbered for your convenience. Copies of the publications may be requested at no obligation through our Readers' Service Dept. Use the handy business reply card which accompanies this issue.

38/ Use readers' service card.

Rad-I-Acc Continuous Non-Contacting Radiation Gages. Pratt & Whitney Co. The company's line of gages used for continuous gaging are covered in this 11-page bulletin. The booklet covers the company's latest developments such as the non-contacting Rad-I-Acc gages, the X-Ray gages for metals and the Beta-Ray gages for non-metallic materials. Photos, diagrams, tables, and descriptions of each are covered.

39/ Use readers' service card.

This Is Permawick. Fluidwick Co. Permawick is a new product now on the market. This product is a combination of oil and cellulose base fibers, and is used as a liquid lubricant. The bulletin covers complete data, photos, and includes story of the development of this new product.

40/ Use readers' service card.

Fawick Standardized Press Applications. Fawick Corp. A new bulletin describing the complete line of package applications for modernization of presses and similar machinery with pneumatic clutch and brake. The bulletin contains data on how to select the proper application for press, and also gives detailed price tables.

41/ Use readers' service card.

Grid Cast Iron Steam Heat Transfer Surface Unit. D. J. Murray Mfg. Co. This is a 4-section catalog describing grid cast iron steam heat transfer surface unit heaters (both horizontal and down blow), blast heaters and radiators. The catalog describes and illustrates one-piece construction high-test cast iron heating sections together with air distribution charts, heating capacities, conversion tables, etc.

42/ Use readers' service card.

Caustic Soda Engineering and Handling Guide. Hooker Electrochemical Co. A guide for safe handling and storage of liquid caustic soda is contained in a 40-page manual. The guide includes large detailed diagrams and photos of tank cars, piping, and storage equipment, together with recommendations for unloading, dilution, transfer and storage. Safety precautions and first aid treatment are also covered.

43/ Use readers' service card.

Inspecting, Recharging and Maintaining Fixed High Pressure Carbon Dioxide Extinguisher Systems. Fire Equipment Manufacturers' Association. An 8-page safety code covering hydrostatic pressure testing methods, criteria for determining cylinder usability and safety precau-

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tions to observe when recharging cylinders. The booklet also discusses the inspection of hoses, valves, nozzles and cylinders.

44/ Use readers' service card.

Diaphragm Valves. Hills-McCanna. This catalog describes Hills-McCanna diaphragm valves in terms of their advantages, applications and specifications. The three basic types of valve operations are shown and dimensional specifications are given. Information is also included on plastic bodies and diaphragms.

45/ Use readers' service card.

Low-cost Pole Buildings for Industry. Dow Chemical Co. This booklet covers the many uses that pole-type construction buildings have in the industry. These buildings are an inexpensive-type of building which can be quickly constructed.

46/ Use readers' service card.

Zeolite Softeners. Cochrane Corp. A publication dealing with the necessity for water softening, explaining the fundamentals of softening and selection of equipment and zeolites.

47/ Use readers' service card.

Gardner Automatic Color Difference Meter. Minneapolis-Honeywell Regulator Co. A data sheet describing color theory, accuracy and features of the Gardner Automatic Color Difference Meter with the Brown ElectroniK amplifier and motors.

48/ Use readers' service card.

Control Valves. Conoflow Corp. Illustrated in a 12-page booklet, is the company's complete line of Series LB control valves. The booklet gives complete details on construction and operating characteristics of the valves.

49/ Use readers' service card.

Batch Control Catalog. Fischer & Porter. A new catalog describing the company's batch control systems. These systems offer simple means for automatically adding a predetermined volume of fluid to a batch process.

50/ Use readers' service card.

Valves. Lunkenheimer Co. Details on the two pressure classes of the company's LQ600 bronze globe valves for a wide variety of services from normal to severe are given in a 4-page circular published by the company.

51/ Use readers' service card.

Shovel-cranes. Link-Belt Speeder Corp. A new catalog giving descriptive information on more than 20 new models, all fully convertible to any standard front-end attachment, which have been introduced by the company in the last few years.

52/ Use readers' service card.

Tygon Flexible Plastic Tubing. U. S. Stoneware Co. Tygon tubing formulations are individually discussed in technical detail in a 28-page booklet printed by the company. Physical properties and chemical resistances based on A. S. T. M. testing methods are presented in chart and table form. Each chapter includes photographic illustrations of actual applications.

53/ Use readers' service card.

1957 Condensed Reference File. Bakelite Co. To help designers, engineers and fabricators choose the right plastic for any job, a revised 1957 edition of the "Condensed Reference File of Bakelite Plastics" has been published. The 16-page booklet is designed as a ready reference for the industry and boils down into easily understood terms.

54/ Use readers' service card.

Texrope Grommet V-Belts. Allis-Chalmers. The construction features of the "Texrope" Grommet V-belt is described in a new bulletin just released by the company.

55/ Use readers' service card.

"Flo-Form" Advantages. H. M. Harper Co. Users of corrosion-resistant fastenings will find valuable information and cost-saving ideas in the colorful new 24-page, semi-technical brochure now available from the company. Flo-Form is the copyrighted name applied to the company's complete process of designing special parts, determining the alloy best suited to the job.

56/ Use readers' service card.

New Connectors for the Laboratory. Burrell Corp. The company is offering a series of new connecting and valving devices for use in the gas, vapor and liquid flow systems of Burrell chromatographic and other analytical instruments. This series is described, priced and explained in detail in a bulletin offered by the company.

57/ Use readers' service card.

Insulating Firebrick. Babcock & Wilcox. Engineers and others involved with the manufacture of structural clay products, in both salt glaze and non-glaze periodic kilns, will be interested in this 8-page bulletin. It gives detailed description of the relationship between heat losses and the weight of refractory linings.

58/ Use readers' service card.

Scav-Ox. Olin Mathieson Chemical Corp. Described in a 16-page illustrated booklet is the new 35 per cent hydrazine solution for removing dissolved oxygen from boiler feedwater. Comprehensive operating data are presented in the form of case studies.

59/ Use readers' service card.

Sun C-850 EP Greases. Sun Oil Co. Two water-resistant extreme-pressure greases especially recommended for shock-loaded bearings are described in a bulletin issued by the company.

60/ Use readers' service card.

Humanics No. 5. Wheeler Associates Inc. The fifth booklet in the series on cost reduction for industrial management. This edition deals with the human or personal issues and problems in labor -management relations. Such topics as team work, planning, employee effort and creative ability are discussed. The booklet ends by discussing the various mental attitudes assumed by both executive and production people.

61/ Use readers' service card.

Water Analysis. Allied Chemical & Dye Corp. A 100-page bulletin contains separate sections on analysis of various types of waters including: Municipal, railroad, swimming pool, polluted and stationery boiler water. Also included are numerous tables of analytic data, conversion factors and turbidimetric and color standards.

62/ Use readers' service card.

Carbon. Union Carbide and Carbon Corp. An 8-page illustrated booklet on "Columbia" activated carbon which is available from the company. The booklet explains the properties of the activated carbon.

63/ Use readers' service card.

Floormaster Trucks-Loadmaster Storage Racks. Lewis-Shepard. Complete specifications on both the trucks and storage racks is illustrated in a new 20-page catalog from the company. It describes the full line which is offered and points out the many industrial applications for this handling equipment.

64/ Use readers' service card.

Prelude to Tomorrow's Automation. Leeds & Northrup Co. A brochure which presents all L & N instruments for chemical process applications. It highlights primary elements for detecting changes in temperature, pH, gas concentrations, and other operating variables.

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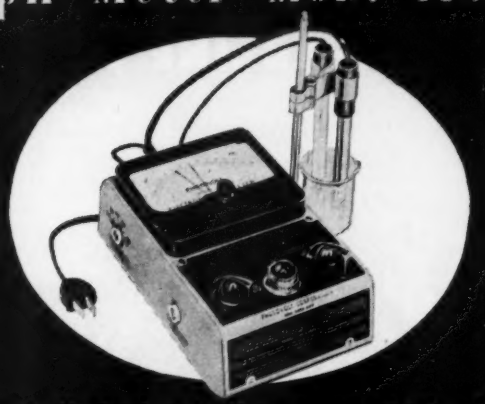

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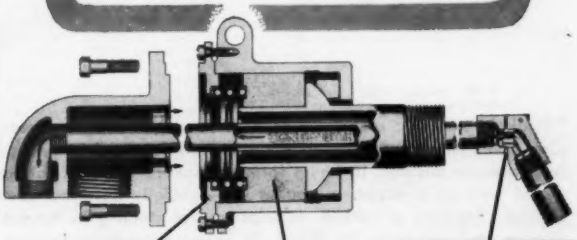
with SYPHON ELBOW



ASSEMBLY PLATE — Holds internal parts in position when head is removed.

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SYPHON ELBOW — Permits use of straight pipe for syphon. Can be inserted or withdrawn right through the joint.

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Bulletin S-2001 has all the facts on this joint-and-elbow combination that supports itself, has no packing, needs no lubrication, outmodes unwieldy syphon pipes. Johnson Joints are also available in pipe-supported and rod-supported types, to suit all operating needs.

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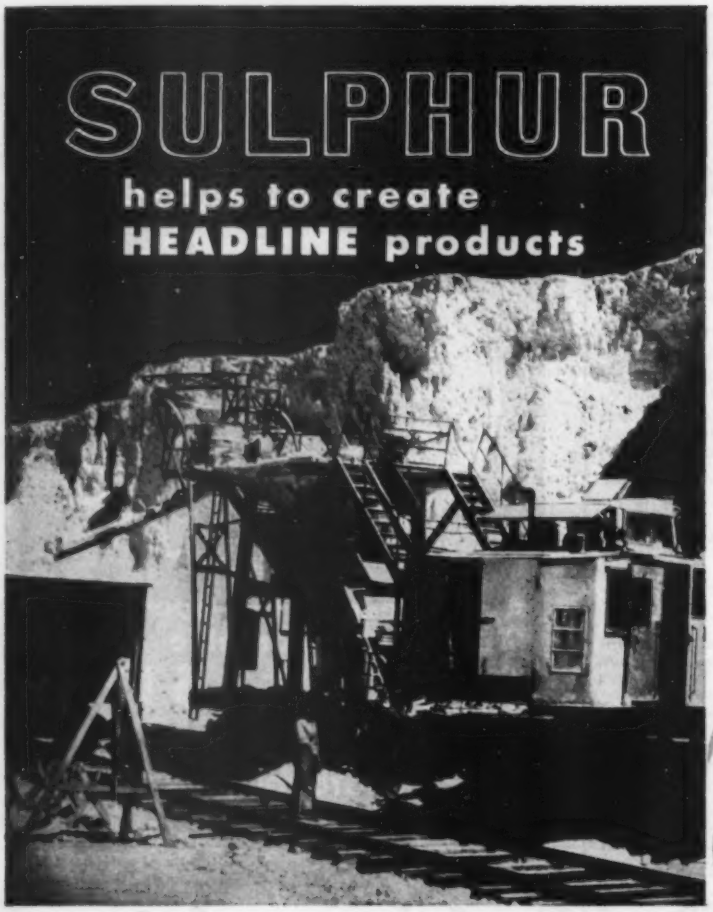

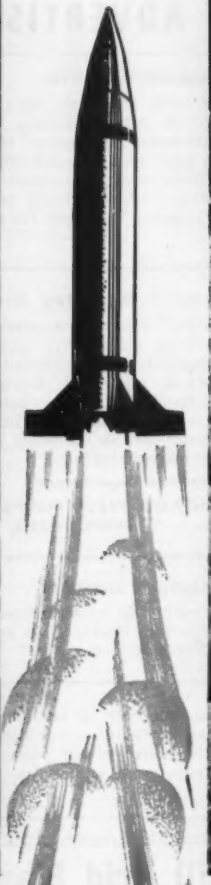

Thiokol®

"Thiokol" synthetic rubber, is an organic polysulfide elastomer. One of its many uses is in solid propellents for long range and high altitude missiles. In liquid form, "Thiokol" synthetic rubber mixed with an oxidizer, is poured into specially designed combustion chambers of rockets. It helps to give stability to the fuel charge and resistance to shock. It promotes uniform burning. When the rocket motor is ignited the mixture burns with great intensity and generates large volumes of gas to propel the rocket.

Solid propellents made with "Thiokol" synthetic rubber have proved their value in rockets over liquid propellents in many ways: they are less costly and easier to manufacture—simple and rugged construction makes handling and launching easier and safer—fuel tanks and complicated feed systems are eliminated.

"Thiokol" synthetic rubber is a product containing a high percentage of Sulphur—its name being derived from the Greek words for sulphur and glue. Here is another example of the continually broadening field in which Sulphur is an important and necessary element.

**A trade name of Thiokol Chemical Corporation.*

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- Moss Bluff, Texas
- Spindletop, Texas
- Worland, Wyoming

MARKET QUOTATIONS

RAGS (Domestic)

New Cotton Cuttings

The following are brokers' and large dealers' average buying prices for sizeable lots in cents per pound f.o.b. New York:

	per cwt.
No. 1 white shirt cuttings	13.00— 13.50
Soft unbleached muslins	15.50— 16.00
Fancy shirt cuttings	4.50— 5.00
No. 1 percales	5.50— 6.00
No. 1 washables	2.25— 2.50
No. 1 light silesias	6.50— 7.00
No. 1 light prints	4.75— 5.00
Light flannelettes	6.50— 7.00
Cottonades	2.75— 3.25
Blue overall cuttings	6.75— 7.25
Blue cheviots	6.75— 7.25
Canton flannels, bleached	10.50— 11.00
Canton flannels, unbleached	10.50— 11.00
Osnaburg cuttings	9.50— 10.50
Underwear cuts, bleached	14.50— 15.00
Underwear cuts, unbleached	14.50— 15.00
Sun tan khaki cuttings	5.00— 5.50
American linen cuttings	6.75— 7.25

Cotton Rags

The following are prices, cents per pound, paid by dealers and brokers f.o.b. New York:

	per cwt.
No. 1 roofing (Chicago)	1.10— 1.15
No. 2 roofing (Chicago)	.70— .75
Twos and blues, repacked	1.50— 1.75
Thirds and blues, repacked	—
No. 1 whites, repacked	—
No. 1 whites, miscellaneous	—
No. 2 whites, repacked	—
No. 2 whites, miscellaneous	—

RAGS (Foreign)

(ex dock New York City)

New Rags

	per cwt.
New dark cuttings	Nominal
New mixed cuttings	
New light silesias	
Light flannelettes	
Unbleached cuttings	
New white cuttings	
New light oxfords	
New light prints	

Old Rags

	per cwt.
No. 1 white linens	Nominal
No. 2 white linens	
No. 3 white linens	
No. 4 white linens	
No. 1 white cottons	
No. 2 white cottons	
No. 3 white cottons	
No. 4 white cottons	
Extra light prints	
Ordinary light prints	
Medium light prints	
Dutch blue cottons	
French blue cottons	
French blue linens	
Checks and blues	
Linsey garments	
Dark cottons	
Old shopperies	

ROPE and BAGGING

F.o.b. and ex dock New York City

Gunny No. 1, domestic	5.50— 6.00
Gunny No. 1, foreign	5.50— 6.00
No. 1 manila rope, domestic	7.75— 8.25
No. 1 manila rope, foreign	6.25— 6.50
New burlap cuts (soft)	5.50— 6.00
Sisal strings	4.25— 4.50
Mixed strings	1.50— 1.75

WASTE PAPER

The following are prices, dollars per net ton, paid by brokers and large dealers for carload quantities of baled stock, f.o.b. cars New York:

No. 1 hard white envelope cuttings	105.00—115.00
No. 1 hard white shavings	85.00— 90.00
No. 1 soft white shavings	50.00— 55.00
Soft white shavings, uncoated	55.00— 65.00
Fly leaf shavings No. 1	25.00— 30.00
Fly leaf, woody, No. 1	30.00— 35.00
Mixed colored shavings	18.00— 20.00
No. 1 books and magazines	17.00— 18.00
Ledger stock, white, No. 1	50.00— 55.00
Ledger stock, colored, No. 1 (Midwest ship)	35.00— 40.00
New manila envelope cuttings (free of groundwood)	70.00— 75.00
New manila envelope cuttings (containing groundwood)	50.00— 55.00
Manila tab cards	60.00— 70.00
Colored tab cards	45.00— 50.00
New all-kraft envelope cuttings	65.00— 70.00
Triple sorted kraft, 100%	35.00— 40.00
No. 1 old kraft	30.00—
White news cuts, No. 1	62.50— 67.50
No. 1 overissue news	16.00— 17.00
Folded news, special	14.00— 15.00
Folded news, ordinary	11.00— 12.00
Old corrugated boxes	14.00— 15.00
New jute corrugated cuts	19.00— 20.00
Mill wrappers	14.00— 16.00
Boxboard cuttings	6.00— 7.00
No. 1 mixed paper	7.00— 8.00

CHEMICALS

F.o.b. New York City

Alum, ammonium	
Granular, bags, works, cwt.	4.30—
Lump, drums, works, cwt	5.05—
Powdered, drums, works, cwt	5.20—
1-Arginine, drums, kilo	74.80—
Blanc Fixe	
Direct process, bags, c.l., works, ton	110.00—
L. c. l., works, ton	120.00—
Bleaching Powder, drums, cwt	
Casein, domestic acid precipitated	
Standard, bags, 10,000-lb. lots or more, shipping point, lb	.32— Nom.
Premium, bags, 10,000-lb. lots or more, shipping point, lb.	.38— Nom.
China Clay, domestic dry-ground, airfloat, 99%	
325-mesh, bags, c. l., Georgia works, ton	10.00—
300-mesh, bags, c. l., Georgia works, ton	13.50— 14.50
Imported, white, lump, bulk, c. l., ex dock Phila, Portland, Me., gross ton	20.00— 35.00
Chlorine, liquid	
Tanks, single units, works, freight equaled, cwt	3.15—
Glycerine, refined (CP, USP) 99%, drums, c. l., delivered lb.	.29⅛—
Litharge, commercial powdered	
Barrels, c. l., works, freight equaled, lb.	.18 —
Rosin, gum, c. l., f.o.b. New York, cwt	
E	9.35—
F	9.35—
G	9.35—
WW	10.40—
Rosin, wood, c. l., f.o.b., shipping point, cwt.	
K, M	8.25—
N	8.30—
WG	8.60—
WW	8.90—
Saltcake, domestic, bulk Works, 100% Na_2SO_4, basis ton	28.00—
Soda Ash	
Dense, 58%, paper bags, c.l. works, cwt	1.90—
Light, 58%, paper bags, c. l. works, cwt	1.85—
Soda, caustic	
Flake, 76%, drums, c. l. works, freight equalled, cwt.	4.70—
Solid, 76%, drums, c. l. works, cwt.	4.30—
Sodium Silicate	
40°Be, 1:3, 2, turbid, drums, c. l., works, cwt.	1.45—
52°Be, turbid, 1:2, 4, drums, c. l., works, cwt.	2.45—
Starch	
Pearl, 140-lb. bags, cwt.	7.42—
Pearl, 100-lb. bags, cwt.	7.27—
Powdered, 100-lb. paper bags, cwt.	7.39—
Sulfur, crude	
Bulk, c. l. mine, contract, long ton	26.50—
Talc	
Domestic, bags, c. l. works, ton	33.00— 39.50
Canadian, ground, bags, c. l. works, ton	20.00— 35.00
Titanium Dioxide	
Pigment, calcium-rutile base, regular, bags, c. l., lb.	.09¼—
High-tinting, drums, c. l., lb.	.09 —
Zinc Oxide Pigment, American process	
Lead-free, bags, c. l., freight allowed, lb.	.14½—
Leaded, 35%, bags, c. l., freight allowed, lb.	.15½—

WOOD PULP

Quotations on domestic and Canadian pulp, dollars per short air-dry ton delivered consuming mills including basic allowances, follow:

Bleached sulfite, No. 1	150.00—
Bleached sulfite, Canadian	150.00—
Unbleached sulfite	130.00—
Unbleached sulfite, Canadian	130.00—
Bleached soda	145.00—
Bleached soda, Canadian	145.00—
Kraft, bleached hardwood	150.00—
Kraft, bleached	152.00—155.00
Kraft, bleached southern	155.00—
Kraft, bleached Canadian	155.00—
Kraft, unbleached southern	117.50—122.50
Kraft, unbleached, Far West	125.00—
Kraft, unbleached Canadian eastern	130.00—
Kraft, unbleached Canadian western	120.00—125.00
Kraft, semi-bleached southern	140.00—
Sulfite screenings	72.50—
Sulfate screenings	67.50—
Groundwood, domestic	82.50— 90.00

Quotations on imported wood pulp, dollars per short air-dry ton on dock American Atlantic ports, follow:

Bleached sulfite, Swedish, freight allowed	150.00—
Bleached sulfite, Norwegian	—
Bleached sulfite, Norwegian, del'd with limited freight allowance	150.00—
Bleached sulfite, Finish, freight allowed	150.00—
Unbleached sulfite, Swedish, freight allowed	130.00—
Unbleached sulfite, Finnish, freight allowed	130.00—
Kraft, unbleached, Swedish, freight allowed	125.00—
Kraft, unbleached, Finnish, freight allowed	125.00—
Kraft, bleached, Swedish, on dock	155.00—
Kraft, bleached, Norwegian	155.00—

PAPER

Quotations are mill quotations Chicago

Boards (prices per ton, delivered in Chicago, 10 tons or more):	
Plain chip	107.50
News vat lined chip	110.00
.009 chip, rolls	100.00
Filled news	111.50
Solid news	114.50
White vat lined chip	144.50
Chip tube and can stock	112.50
Single manila lined chip	162.50
Single jute lined chip	147.50
Container, 42-lb.	
Kraft liner (per 1000 sq. ft.)	2.68
White patent coated	
.020	175.00
.018	177.50
.016	182.50
Book Paper (f.o.b. Chicago, c.l. cases per cwt):	
No. 1 enamels	19.80
No. 2 enamels	18.80
Machine-coated, 45- to 100-lb.	14.75— 18.40
60-lb. + uncoated offset, 25 × 38 (2000 lb.)	16.55
"A" grade English finish untrimmed, 25 × 38 (2000 lb.)	15.65
Rag Content Bond (white, 5000 to 10,000-lb. sub 20, ream sealed cartons):	per cwt
100% rag	63.20
75% "	48.45
50% "	36.95
25% "	31.00
Rag Content Ledger (white, 5000 to 10,000-lb., ream sealed cartons):	
100% rag	64.40
75% "	49.60
50% "	38.10
25% "	32.20
Sulfite Bond (white, 5000 to 10,000-lb. sub 20, ream sealed cartons):	
No. 1	21.85
No. 2	21.15
No. 4	19.75
Sulfite Ledger (white, 5000 to 10,000-lb., ream sealed cartons):	
No. 1	23.10
No. 2	22.35
No. 4	20.95
Newsprint (contract base price)	per ton
Rolls, standard	131.00
Rolls, spot	145.00—175.00
Sheets	Standard differentials
Tissues (carlots)	per ream
White No. 1	
White No. 2	
Bleached anti-tarnish	
Colored	
Anti-tarnish kraft	
Manila	
Napkins, semi-crepe (12½ lb. to M shts) per case	
Napkins, full crepe and embossed (12½ lb. to M shts) per case	
Toilet, bleached (M shts) per case	
Toilet, unbleached (M shts) per case	
Wrappings (kraft, basis 50 lb. and heavier)	per cwt
Standard wrapping	9.25
Butchers, counter rolls	10.25
Standard bagging, mill rolls	
Shipping sack, mill rolls	
Gumming, mill rolls	
Asphalting, mill rolls	
Envelope, mill rolls	

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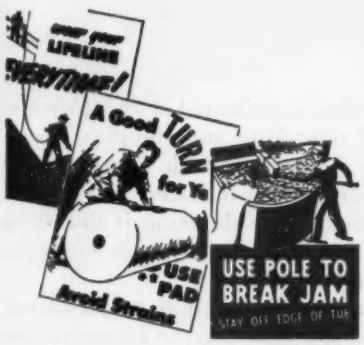
POSTERS
— A POTENT SAFETY TOOL



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NATIONAL SAFETY COUNCIL

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Chicago 11, Illinois

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When writing them, please mention The PAPER INDUSTRY.

Refer to the Paper and Pulp Mill Catalogue and Engineering Handbook at your mill office for complete listing of all advertisers' products.

ACF Valves 893
Aerovent Fan Company, Inc. .....
Albany Felt Company .....
American Industrial Clays, Inc. 830
American Cast Iron Pipe Co. .....
American Cyanamid Co. 837
American Defibrator, Inc. .....
Anheuser-Busch, Inc .....
Annin Company, The .....
Antara Chemicals Division .....
Appleton Machine Co., The 836
Appleton Wire Works, Inc. .....
Appleton Wood Products Co. 902
Appleton Woolen Mills .....
Arnold, Hoffman & Co., Inc. .....
Askania Regulator Company 903
Asten-Hill Mfg. Co. .....
Atkins Saw Division .....
Aurora Pump Division 900

Babcock & Wilcox Co., Tubular Products Division .....
Barco Manufacturing Co. .....
Barrell Co., Wm. L. .....
Bauer Bros. Co., The 839
Beloit Iron Works 869
Black-Clawson Company, The 879
Bolton & Sons, Inc., John W. 835
Bowsher Co., The N. P. .....

Cameron Machine Co. .....
Carthage Machine Co. .....
Chicago Bridge & Iron Company 832
Classified Advertising 907
Clinton Corn Processing Co. .....
Cooper Alloy Corporation 846
Corn Products Refining Co. .....
Crane Company 866
Crawford Fitting Company 899
Curtiss-Wright Corporation .....

Darling & Company ..... 3rd Cover
DeZurik Corporation .....
Draper Brothers Company 881

Eastwood-Nealley Corporation .....
Egan & Company, Frank W. .....
Electric Eye Equipment Company .....
English China Clays Sales Corp. 890
Federici Associates 886
Fischer & Porter Company .....
Fisher Governor Co. .....
Fritz Publications, Inc. 896, 904, 906
Fulton Iron Works Co. 847

General Chemical Division 834
General Dyestuff Company .....
Gifford-Wood Co. .....
Gilbert & Nash Company .....
Goslin-Birmingham Mfg. Co. .....
Graton & Knight Company .....

Hanchett Manufacturing Co. .....
Hercules Powder Company 864-865
Hubinger Company, The 880
Humphrey Elevator Company 901
Huyck & Sons, F. C. .....

Improved Machinery, Inc. 838
Ingersoll-Rand .....

Jackson & Church Company .....
Jenssen Company Inc., G. D. 907
Johnson Corporation, The 907
Josam Manufacturing Company .....

Kalamazoo Tank & Silo Co. 902
Koppers Company, Inc. .....

Ladish Co. 843
Langston Co., Samuel M. 882
Layne & Bowler, Inc. ..... 2nd Cover
Lindsay Wire Weaving Co., The .....
Link-Belt Company 833
Lockport Felt Company .....
Lodding Engineering Corp. 885
Lunkenheimer Co., The .....

Magnuson Products Corp. .....
Master Builders Co., The .....
Mead Pulp Sales, Inc. .....
Minerals & Chemicals Corp. of America ..
Moisture Register Co. 877
Morden Machines Company .....
Morey Paper Mill Supply Co. .....
Morningstar, Nicol, Inc. .....
Multiple Corporation 887
Murray Mfg. Co., D. J. .....

Nash Engineering Co., The 871
National Aluminate Corp. 828
National Aniline Division .....
National Safety Council 911
Naylor Pipe Company 898
Nelson Company, The .....
Nichols Engr. & Research Corp. .....
Norgren Co., C. A. 845
Northwest Engineering Company .....
Norton Company .....

Paper and Pulp Mill Catalogue 896
Paper Industry, The 904, 906
Paper Makers & Merchants Directory of All Nations 904
Penick & Ford Ltd., Inc. .....
Photovolt Corporation 907
Powell Valves .....
Preload Company, Inc., The .....
Prior Chemical Corporation .....
Pusey & Jones Corp., The 874

Raymond Service, Inc., Chas. P. .....
Read Standard Corporation 840
Red-Ray Mfg. Co., Inc. .....
Roots-Connersville Blower Division 844
Ross Engineering Corp., J. O. .....
Ross Midwest Fulton Corp. .....
Ross Paper Machinery Company 906
Ryerson & Son, Inc., Jos. T. 827

Sandy Hill Iron & Brass Works, The .....
St. Regis Paper Co. .....
Scapa Dryers, Inc. .....
Semet-Solvay Petrochemical Division .....
Shuler & Benninghofen 894
Signode Steel Strapping Company .....
Smidth & Co., F. L. .....
Stadler, Hurter & Company .....
Staley Mfg. Co., A. E. .....
Standard Oil Co. (Indiana) 842
Stein, Hall & Company .....
Stickle Steam Specialties Co. 889
Sutherland Refiner Corp. .....
Swenson Evaporator Company ..... 1st Cover

Taylor-Wharton Co. ..... 4th Cover
Testing Machines, Inc. .....
Texas Gulf Sulphur Co. 908
Torrington Company, The .....

U.S.A. — Treasury Department 910

Valley Iron Works Company. .....
Vapo Systems Co., Inc. 876
Viking Instruments, Inc. .....

Washington Steel Corp. 868
Waterbury Felt Company 907
W-K-M Manufacturing Co., Inc. 893
Westinghouse Electric Corporation .....
Weyerhaeuser Timber Co. .....
Whiting Corporation ..... 1st Cover
Williams-Gray Company .....
Wisconsin Wire Works 902

Yarnall-Waring Company 841
Youngstown Welding & Engineering Company, The .....

Professional & Business Service Section
Sitrine Company, J. E. 906

PAPER INDUSTRY

Whither?

... in production, processes, new products, markets

Southern pine advances to a new potential

The total 1956 output of southern pine lumber is estimated at approximately 8,556,000 bd. ft. A rapid expansion of debarking and chipping operations among the southern pine mills may in the forseeable future supply some 2,500,000 cords of pulpwood chips to the paper industry.

An indication of the rapid development in this direction is shown by the fact that debarking and chipping facilities increased from a single installation in 1952 to more than 100 by the end of 1956.

According to a report by the Southern Pine Association, reforestation, improved fire protection and forest management have been so extensive that the growth of southern pine sawtimber now exceeds cut by 22 per cent, or by 2½ billion bd. ft. per year.

Bundling of pulpwood facilitates handling and transportation

The widespread use of wheel tractor transport in Finland has led to a method of handling bundled loads of pulpwood.

The method has the advantage of a greater economy and facilitates mechanized loading and unloading. Loading is done by means of a boom crane, while unloading is most satisfactorily achieved with anchor hooks or tipping ramps.

Determination of lignin by absorptiometric method

According to results to be published by C. S. Joyce and T. N. Kleinert of the Canadian Pulp & Paper Research Institute, measurements at the wave length 205 μ appear exceedingly promising for the evaluation of the lignin content in pulps. At this wave length the absorbance values obtained seem to be specific for the lignin molecule, and the risk of interference from other light absorbing molecules is greatly minimized.

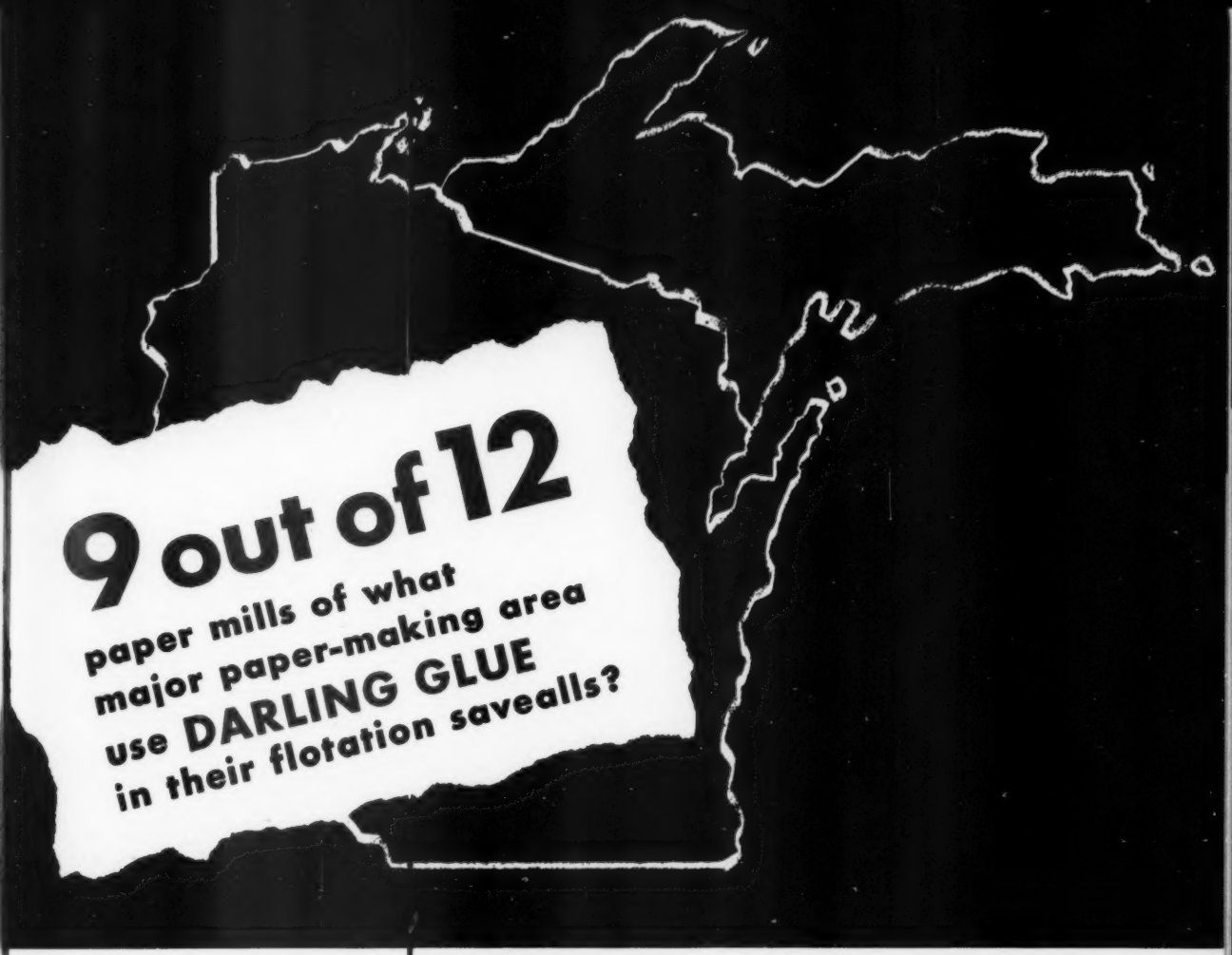
A new package for "heat-and-eat" food products

A new linear polyethylene resin, developed by Hercules Powder Co., shows considerable promise as a plastic packaging film for pre-cooked food products. The film is resistant to heat up to 240° F and has a high acceptability factor for direct contact with food products.

It is expected that the new film will broaden the range of foods that can be economically adapted to the "heat-and-eat" form of packaging.

Latin American imports of paper products

Paper and board consumption in Central and South America is expected to increase to 3,700,000 tons by 1965. Of this amount, in line with the current expansion program, 1,500,000 tons will be produced in Latin America, leaving a balance of 2,200,000 tons of import requirements.



9 out of 12

paper mills of what major paper-making area use DARLING GLUE in their flotation savealls?

ANSWER • **9 out of 12 paper mills in WISCONSIN and the UPPER PENINSULA.**

QUESTION • WHY?

ANSWER • **Because, in FLOTATION TYPE SAVEALLS— comparative, competitive tests in paper mills throughout the country have established this significant fact—**

In the great majority of cases, one of DARLING'S specifically-formulated GLUES will reduce costs, while maintaining or improving flocculating efficiency.

We'd like to work with you in making just such a test in your mill. The entire cost is on us. You've nothing to lose . . . plenty to gain. You can make arrangements through your Darling sales representative. Or write or call us collect.

DARLING & COMPANY
GLUE DIVISION
4201 South Ashland Avenue • Chicago 9, Illinois

DARLING'S improved BONE GLUE

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DON'T LET THIS FELLOW EAT UP YOUR PROFITS. SWITCH TO TISCO ROTOR VANE SEGMENTS

and enjoy smooth running, long-life Hydrapulper operation. TISCO vanes last up to 500% longer. Two materials are available, 150Y chrome alloy for SEVERE ABRASION and 132 stainless alloy for ABRASION-CORROSION. Write for bulletin "H" today.

TAYLOR-WHARTON CO.

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